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GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

Date: 8/10/78

Gr Ed

Project Title: Continuous Operation of the French Meteor Radar on Puerto Rico, 1978-79

Project No: G-35-640

Project Director: Dr. R. G. Roper

Sponsor: National Science Foundation, Washington, D.C. 20550

Agreement Period: From 6/15/78 Until 11/30/79*
* Includes 6 month flexibility period.

Type Agreement: Grant No. ATM 78-10089

Amount: $74,000 NSF Funds (G-35-640)
3,252 GIT Contribution (G-35-331)
$77,252 TOTAL

Reports Required: Annual Summary Reports; Final Technical Report.

Sponsor Contact Person (s):

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Defense Priority Rating: n/a

Assigned to: Geophysical Sciences (School/Laboratory)

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CA-3 (3/76)

SPONSORED PROJECT TERMINATION

Date: June 23, 1981

Project Title: Continuous Operation of the French Meteor Radar on Puerto Rico, 1978-80

Project No: G-35-640

Project Director: Dr. R. G. Roper

Sponsor: National Science Foundation

Effective Termination Date: 1/31/81

Clearance of Accounting Charges: 1/31/81

Grant/Contract Closeout Actions Remaining:

- _ Final Invoice and Closing Documents
- X Final Fiscal ~~Report~~ Accounting (FCTR)
- X Final Report of Inventions
- _ Govt. Property Inventory & Related Certificate
- _ Classified Material Certificate
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G-35-610

GEORGIA INSTITUTE OF TECHNOLOGY

SCHOOL OF GEOPHYSICAL SCIENCES

Atlanta, Georgia 30332
(404) 894-3892

October 3, 1979

Dr. H. C. Carlson
Atmospheric Research Section (Aeronomy)
National Science Foundation
Room 644
1800 G Street, N.W.
Washington, D. C. 20550

Dear Herb:

While I believe I have done a pretty good job in keeping you informed about progress (or lack of same) with the French meteor radar, I did forget to submit an "Annual Technical Letter." It is enclosed herewith.

Best wishes,

Dr. R. G. Roper
Professor

RGR+ap

Enclosure

10-30-79

(2 cys)

GEORGIA INSTITUTE OF TECHNOLOGY

SCHOOL OF GEOPHYSICAL SCIENCES

Atlanta, Georgia 30332
(404) ~~XXXXXXX~~
894-3892

October 3, 1979

To: Dr. H. C. Carslon
Atmospheric Research Section (Aeronomy)
National Science Foundation
Room 644
1800 G Street, N. W.
Washington, D. C. 20550

From: Dr. R. G. Roper

Subject: Annual Technical Letter, Grant No. ATM78-10089 (Georgia Tech Contract No. G-35-640)
"Continuous Operation of the French Meteor Radar at Ramey, Puerto Rico, 1978-79"

Background: In 1977, the French National Center for Telecommunications Studies (CNET) installed a portable meteor wind radar at Ramey, Puerto Rico. Their purpose was to run four two week campaigns in the fall, winter, spring, and summer 1977-78. After installation, and the first highly successful run in August of 1977, some changes proposed at CNET placed the future of the meteor group in doubt. Subsequently, the principal investigator was involved in discussions with NSF and CNET which eventually resulted in the subject grant. In order to meet the grant objective of continuous operation, conversion of the system from analog tape output (requiring a tape change every 6 to 8 hours, and subsequent analog to digital conversion) to digital tape output--in fact, the reproduction of the system already operated by the French at Montpazier in France--was proposed.

Text: Prior to the commencement of this grant on July 1, 1978, a visit was made to Puerto Rico in March of that year to familiarize myself with the equipment. While there, I interviewed Stanley Henson, who was then employed in Mayaguez, for the position of resident research engineer with the project. Stanley was subsequently hired as of July 1, 1978, and left immediately for two weeks orientation and training on the Montpazier system. He returned to Ramey with two of the French research staff for the July-August, 1978 run. I was able to join them for three days, to plan the finer details of continued operation. The data from this run has been forwarded to John Mathews, of Case Western Reserve, for incorporation with his simultaneously measured Arecibo incoherent scatter data into a joint publication.

The French had hoped to bring the system interface circuitry with them in August, but had detected some faults during checkout, and the interface delivery was delayed until January '79. This timing coincided with the delivery to Tech of the HP2108M computer, which had been delayed by computer purchasing procedures required by the State of Georgia. Subsequent on campus testing of the system, using software provided by the French, revealed that economies in hardware purchase had compromised system performance to a greater extent than planned--direct memory access was found to be a necessity, rather than the initially considered luxury! In addition, an original assumption that the French interface circuitry performed the analog to digital conversions proved to be false. The direct memory access circuitry was purchased using funds which had not been required for transmitter AC power (again, with considerable delay because of State purchasing procedures), and the A/D conversion problem was sloved by "borrowing" a converter from the School of Aerospace Engineering.

Meanwhile, in addition to familiarizing himself with the meteor radar, Stan Henson was able to assist Dr. Ralph Dyce, of the Arecibo Observatory, with the upper atmosphere heating facility, and also Dr. David Rind, of Lamont Observatory, with the installation and checkout of an infrasound facility at the Ramey receiving site.

In March '79, Stan Henson and I carried out an eight day run (analog), in conjunction with observations being made by John Mathews at Arecibo. The analog tapes were subsequently reduced and analyzed by the French, and the results will be incorporated in the next report.

A further setback to the program occurred with the resignation of Stan Henson at the end of the contract year. Stan had done an excellent job during a very frustrating period, but for personal reasons wished to return with his family to the U.S. I was fortunate to find as his replacement, Bill Cyphers, who was then a Research Associate in the Instrumentation Lab in Aerospace Engineering. Bill's background in the construction and maintenance of equipment used in ionspheric research in Japan, Greenland, and the Bahamas while in the Navy suits him ideally for the task which, incidentally, he hopes will be long term! He has, of course, had to spend considerable time familiarizing himself with the equipment since he went to Ramey in July.

We were most fortunate to have Michel Glass of CNET with us for the installation of the computer in August. Without him, the job would have taken months instead of weeks. He worked with Bill for ten days before I took the computer down on August 22. Unfortunately, final system checkout was delayed by Hurricane David. With both Michel and I obliged to leave because of other commitments, Bill has been proceeding at a somewhat slower pace (compared to the six man weeks the three of us put in in six days). Bill first job was to clean up the minimal damage--fortunately, the trailer survived unscathed, and the four antennae blown over were able to be repaired in the field. Dave Rind's gear did not fare quite as well--Bill is currently relaying cable, prior to installation of some new sensors.

Bill has not been able to remove what we hope is the last "bug" from the digital system, but has plenty to keep him busy in that the Coastguard, who took over our transmitter site from the Navy early this year, wants to use the site as a Little League baseball field! We have stalled as long as we can on this issue (hoping that they might make other arrangements). Since we do not have all the documentation on the French interface, and Rene Bernard is bringing it with him when he visits Tech October 14-17, I hope we can solve the "bug" problem when I go to Ramey again at the end of this month.

The first year of this grant has been frustrating to the extreme--however, it would have been much worse without the support given by Hal Craft, Jim Walker and Ron Woodman, in particular, and other members of the Arecibo Observatory staff. Without their help, the road to Ramey would have been much longer.

While I realize that the grant goal of continuous operation has not yet been met, this objective is now in sight, and I am looking forward to a good year coming up.

Finally, while I have no official word yet, it appears that the French radar will be available for use at Ramey at least through the end of MAP (1985).

Respectfully submitted,

Dr. R. G. Roper
Professor

RGR+ap

G-35-640

GEORGIA INSTITUTE OF TECHNOLOGY

SCHOOL OF GEOPHYSICAL SCIENCES

Atlanta, Georgia 30332
(404) 894-2857

September 9, 1980

Dr. Vincent Whitmore
Atmospheric Research (Aeronomy)
National Science Foundation
Room 644
1800 G Street, N.W.
Washington, D.C. 20550

Annual Technical Letter: Grant No. ATM78-10089
"Continuous Operation of the French Meteor Wind Radar at Ramey, Puerto Rico"

Dear Dr. Whitmore:

This has not been a good year for meteor wind radars, and, unfortunately, the Ramey radar is no exception. Internationally, I know of four facilities, in addition to that at Ramey, which have, or are about to move to new field sites. But first things first:

The contract year started out with a change in field site personnel July 1, 1979. Stan Henson, who had been my resident engineer at Ramey, returned to the States with his family. I was fortunate to be able to replace him with Bill Cyphers, one of the technicians who had worked with me on the meteor radar here at Tech, but, because of the more complex nature of the French system at Ramey, considerable on the job training (mostly self-taught) has been required.

We were fortunate to have Michel Glass of CNET with us at Ramey for the month of August, which coincided with the installation of the HP2108 computer. His presence, and knowledge of the sister system in operation at Montpazier, France, enabled the installation to proceed far more swiftly than had he not been present. However, there were some problems with the hardware interface which were not sorted out when he left. Bill Cyphers had most of these solved by early October when a lightning strike on the powerline took out some 30 integrated circuits and a fistful of diodes in the radar control module, and the direct memory access and one memory board in the computer (lightning arresters have been installed which will hopefully prevent a recurrence of this problem). Considerable time (for which we were not charged) was wasted while the HP service engineer from San Juan familiarized himself with our magnetic tape based system (he had not seen one before). The bill for replacement boards was still substantial.

In early November, we received an ultimatum from the Coastguard, who had taken over from the Navy the land on which the transmitter was located, to move the transmitter. To make a long story short, through the good graces of the FAA and PRIDCO (the government Puerto Rico Industrial Development Company), with both of whom Bill Cyphers had been able to establish rapport, we were able to relocate the transmitter just outside the airport fence adjacent to Gate 5 at Ramey Base. Antennas were set up and the property fenced.

When the system was brought up again in early February, several problems developed. Bill proceeded to completely realign the master oscillator in the receiving trailer, the S band link to the transmitter, the transmitter itself, and finally the whole receiving system. This involved some rebuilding of the equipment, and the discovery that, unless the receiving trailer was kept at 25 $\pm$ 2°C, the pilot frequencies were attenuated by drift in the respective passive filters (the discovery was made when one of the air conditioners failed - Bill subsequently replaced a drive motor bearing). Tests were run in late March, and I went down to Ramey in April. A problem with the echo date/time clock was solved, and what was hoped to be routine observation was commenced. The first data tape was dispatched to France for assessment in May.

In July, Dr. J-L. Fellous, of CNET, and I met at the Equatorial Aeronomy Conference in Aguadilla, P.R., and discussed the results of the first tape reduction. Because of gaps in the data caused by a lack of adequate documentation on the start up procedures after a power failure (not a week goes by without a P.R. Power Company outage!) the tape was marginal for wind reduction, although the individual echo statistics were excellent.

Dr. Fellous spent some time with Bill at the fieldsite, reviewing startup procedures and echo acceptance limits, and we were all set for a site visit by Conference participants when the computer failed (a classic example of Murphy's Law!). The fault was traced to the computer power supply mother board, but without knowledge of the equivalents to the HP brand numbers on the chips, could not be fixed. (A new mother board was subsequently flown in from the States and installed by HP - unfortunately, well after the Conference was over).

Since Bill had worked non-stop for over a year, he took a few days off at the end of August. On his return, one of the air conditioners in the receiver trailer would not start up, and without it the trailer temperature cannot be maintained within the required tolerance. Bill is now in the process of fixing the air conditioner.

To help overcome part of the power failure problem, a memory protect board for the computer has been purchased, and was mailed to P.R. last week.

Once the air conditioner is fixed, we anticipate being able to proceed with our goal of routine continuous operation. Having survived the last twelve months, Bill and I feel we can survive anything. We just hope we don't have to!

Yours sincerely,

Dr. R. G. Roper
Professor

RGR/spz

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

FINAL PROJECT REPORT

NSF FORM 98A

PLEASE READ INSTRUCTIONS ON REVERSE BEFORE COMPLETING

PART I—PROJECT IDENTIFICATION INFORMATION

1. Institution and Address	2. NSF Program	3. NSF Award Number
Georgia Institute of Technology School of Geophysical Sciences Atlanta, Ga. 30332	Atmospheric Res. (Aeronomy)	ATM78-10089
	4. Award Period From 6/15/78 To 1/31/81	5. Cumulative Award Amount $127,000

6. Project Title

Continuous Operation of the French Meteor Radar on Puerto Rico, 1978-80

PART II—SUMMARY OF COMPLETED PROJECT *(FOR PUBLIC USE)*

This grant resulted from an offer to the National Science Foundation by the French National Center for Telecommunication Studies (CNET) to leave the portable meteor wind radar which they had installed at Ramey, Puerto Rico, on site if it could continue operation. As installed by the French, the system recorded realtime data in analog form, at the rate of some 7200 feet of tape a day. Subsequent processing of these tapes was a time consuming operation. It was decided that, if the system was to operate continuously (highly desirable from the scientific point of veiw), computer control of the radar, with digital tape output (approximately 2400 feet of tape a week, with rapid subsequent processing) was essential.

During the grant period, analog data was gathered in August, 1978, and March, 1979. The computer was installed in August, 1979; final system checkout was interrupted in October by a lightning strike on the receiver trailer, which decimated part of the interface circuitry, and two boards in the computer. Subsequent repair was interrupted by a directive from the U.S. Coastguard, who had assumed control of the Navy land on which the transmitter was located, to remove same. A new site was found, the transmitter relocated antennnae re-erected, and the receiving site refurbished. Operation recommenced in April 1980. The long term continuous operation has been prejudiced by the frequent outages and low voltage of the power lines. Data was gathered from April through June, 1980, and again August through September,1980. Low line voltage significantly affected the quality of the data through February, 1981. The system has been in continuous operation since March, 1981, when a new powerline was installed, at no cost to the project, by the Puerto Rican Electric Power Company.

PART III—TECHNICAL INFORMATION *(FOR PROGRAM MANAGEMENT USES)*

ITEM *(Check appropriate blocks)*	NONE	ATTACHED	PREVIOUSLY FURNISHED	TO BE FURNISHED SEPARATELY TO PROGRAM: Check (✓)	TO BE FURNISHED SEPARATELY TO PROGRAM: Approx. Date
a. Abstracts of Theses	X				
b. Publication Citations		X			
c. Data on Scientific Collaborators		X			
d. Information on Inventions	X				
e. Technical Description of Project and Results				X	5/31/81
f. Other *(specify)*					

2. Principal Investigator/Project Director Name *(Typed)*	3. Principal Investigator/Project Director Signature	4. Date
Dr. R. G. Roper		4/29/81

NSF Form 98A

Publication Citations:

R. G. Roper, "Dynamics of the Equatorial Mesopause," presented at the Sixth International Symposium on Equatorial Aeronomy, Aguadilla, Puerto Rico, July, 1980.

Data on Scientific Collaborators:

The following French scientists from the French National Center of Telecommunications Studies (CNET) have contributed significantly to this project:

Dr. Rene Bernard, data reduction and interpretation

Dr. Jean-Louis Fellous, with insights into equipment operation, and data analysis and interpretation

Dr. Michel Glass, who arranged to vacation with his family in Puerto Rico in August, 1979, and spent most of that time ensuring the satisfactory installation of the computer in the receiver trailer at Ramey

CNET itself, for providing use of the portable meteor wind radar.

FINAL TECHNICAL REPORT
GT/PROJECT NO. G-35-640

CONTINUOUS OPERATION OF THE FRENCH METEOR WIND RADAR AT RAMEY, PUERTO RICO, 1978–80

By
R. G. Roper

Research Supported by
THE ATMOSPHERIC RESEARCH SECTION (AERONOMY)
NATIONAL SCIENCE FOUNDATION

Under
Grant No. ATM78–10089

Contract Period July 1, 1978 – January 31, 1981

November 1981

GEORGIA INSTITUTE OF TECHNOLOGY
A UNIT OF THE UNIVERSITY SYSTEM OF GEORGIA
SCHOOL OF GEOPHYSICAL SCIENCES
ATLANTA, GEORGIA 30332

1981

CONTINUOUS OPERATION OF THE FRENCH METEOR WIND RADAR AT RAMEY, PUERTO RICO, 1978-80

R. G. ROPER

Georgia Institute of Technology
School of Geophysical Sciences
Atlanta, Georgia 30332

Final Technical Report on Research Supported by the Atmospheric Research Section (Aeronomy) of the National Science Foundation, under Grant No. ATM78-10089

Georgia Tech Project No. G-35-640
Contract Period July 1, 1978 - January 31, 1981

November, 1981

The modification and operation of the meteor wind radar at Ramey, Puerto Rico, is a joint venture of the French National Center for Telecommunications Studies (CNET) and the Georgia Institute of Technology. The generosity of CNET in making the radar available for operation beyond its original 1977-78 dedication to the measurement of equatorial mesopause level winds, and the cooperation shown by the French engineers and scientists, particularly Drs. Michel Glass, Rene Bernard, and Jean-Louis Fellous, is gratefully acknowledged.

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REFERENCES

APPENDIX I CNET SYSTEM BIBLIOGRAPHY

APPENDIX II DYNAMICS OF THE EQUATORIAL MESOPAUSE (Paper presented at the Sixth International Symposium on Equatorial Aeronomy, Aguadilla, Puerto Rico, July, 1980)

APPENDIX III THE DATA ACQUISITION COMPUTER PROGRAM

APPENDIX IV THE DATA REDUCTION COMPUTER PROGRAMS

Continuous Operation of the French Meteor Wind Radar at Ramey, Puerto Rico, 1978-80

ABSTRACT

The objective of this two year grant was to obtain continuous measurements of equatorial atmosphere winds between altitudes of 85 and 105 kilometers, using the meteor wind radar installed by the French National Center for Telecommunications Studies (CNET) at Ramey, Puerto Rico (18°N, 67°W) in 1977. The proposed continuous operations involved conversion from the analog recording mode used by the French in their 1977-78 campaigns to computer control and digital data recording. The conversion was completed, and the first digigal tape recorded in April, 1980. Continuous records were obtained in 1980 from May 15 through June 11, August 11 through August 23, and October 6 through October 15, and these have been reduced to winds. Two major problems were encountered. The first, due to F region backscatter of the radar signal folding back into the range gate interval, is obvious in the records, and blanketed what would have been useable echoes. This backscatter is a "daytime" phenomenon, commencing soon after sunrise and persisting into the evening hours: it is decreasing as solar activity decreases. The second was due to incorrect sampling of the received noise level, resulting in rejection of additional echoes for what was interpreted by the system as an insufficient signal to noise ratio.

A continuous problem has been line power outages, and more seriously, undervoltage, leading not only to system malfunction, but also to hardware failure. A new power line, installed by the Puerto Rican Power Company, has eliminated the low voltage problem. Power outages continue to be the major source of system downtime. The system has been in continuous operation since late February. 1981, but these tapes have not yet been processed.

1.1 Introduction

In the spring of 1977, the French Centre Nationale d' Etudes de Telecommunications (CNET) installed a portable meteor radar system at Ramey, Puerto Rico, to measure equatorial mesopause level winds. The site was chosen for its proximity to the Arecibo Observatory, and its accessibility (direct flights between San Juan and Paris, necessary since the system was operated in a campaign mode, with approximately 10 days data being gathered every three months). The radar system had been well tested, being used not only in France, but at Kiruna in Sweden, observing high latitude mesopause level winds. Excellent technical manuals describing the system have been published (see Appendix I for list).

In late 1977, CNET suggested to NSF that the system could remain in Puerto Rico after their planned program was over, provided someone was interested in operating it. This grant resulted from these deliberations.

One disadvantage of the system as operated by the French was that all recording was done on analog tape in real time. The thirty or forty tapes resulting from each ten day campaign were taken back to France, replayed at a four times real time rate, useable echoes digitized, and subsequently processed to produce winds. A similar system operated by CNET at Montpazier, France, was computer controlled, and produced digitized echoes in real time, one digital tape being the equivalent of twenty analog tapes.

It was decided that the most desirable mode of operation of the system was to record data continuously, in order to investigate the synoptic dynamics of the equatorial mesopause. For such operation. computer control with digitized output was essential.

1.2 The CNET Portable Meteor Wind Radar

This radar evolved from the Garchy svstem described in detail bv Spizzichino (1972). The original Garchy system was continuous wave (CW), with three frequencies transmitted simultaneously in order to measure range. In order to gate out aircraft interference (the major disadvantage of CW operation), a long pulse system was developed. The svstem measured only one component of the wind; as installed at Ramev (18°N, 67°W), it measures the zonal component, looking eastward so as to sample a volume of the atmosphere in common with the incoherent scatter radar at the Arecibo Observatory (see Figure 4, Appendix II).

As originally installed by the French in the summer of 1977, the transmit and receive sites were separated by a few km, with the transmitter on Navy land on the edge of a recreational area in the town of Ramey, and the receivers on the grounds of the U.S. Air Force Ramey Solar Observatory. All the radio frequencies required by the system are generated at the receiving site;

those required by the transmitter are beamed to the transmitting site on a microwave link. An exhaustive calibration of the system is performed automatically every ninety minutes - receiver linearity is checked as are the antenna-receiver - phase meter echo arrival angle determinations, and the calibrations recorded for use in subsequent data reduction. As originally installed by the French, all receiver outputs were written in analog form on a continuously running magnetic tape.

1.3 Georgia Tech Operation of the Ramey Radar

The hiring of Stanley Henson on July 1, 1978, marked the commencement of Georgia Tech involvement with the French Meteor Radar at Ramey under the subject grant. Stan left immediately for France for two weeks orientation and training on the Montpazier system, a "twin" to the analog recording Ramey radar, but with computer control and digital output. He returned to Ramey with two of the French CNET research staff for the July-August, 1978 campaign. The winds deduced from this run have been published. (Mathews, et al, 1981).

The French had hoped to bring the system-to-computer interface circuitry with them in July, but had detected some faults during checkout, and the interface delivery was delayed until January, '79. This timing coincided with the delivery to Tech of the HP2108M computer, which had been delayed by purchase procedures required by the State of Georgia. Subsequent on-campus testing of the system, using softwave provided by the French, revealed that economy in hardware purchase had compromised system performance to a greater extent than planned - direct memory access was found to be a necessity rather than the initially considered luxury. In addition, an original assumption that the French interface performed the analog to digital conversion proved to be false. The direct memory access cirduitry was purchased using funds which had not been required for transmitting AC power, and the A/D conversion problem was solved by "borrowing" a converter from the School of Aerospace Engineering (this HP 5610A A/D converter was subsequently purchased by the project).

In March, 1978, Stan Henson and the Principal Investigator carried out an eight day run (analog), in conjunction with observations being made by Dr. J. D. Mathews of Case Western Reserve University, using the 430MHz Arecibo radar for D region drift measurement. The analog tapes were subsequently reduced at CNET, and the results presented at the Sixth International Symposium on Equatorial Aeronomy, Aguadilla, Puerto Rico, July, 1980. (see Appendix II).

Because of the delay in computer installation, Stan was able, during this period, to assist Dr. Rolph Dyce, of Arecibo Observatory with the installation of the HF Heating Facility at Arecibo, and Dr. David Rind, with the installation at the Ramey Solar Observatory, of an infrasound detection system designed to measure winds in the upper stratosphere and the lower thermosphere.

At the end of the first contract year, (in June, 1979), Stan Henson resigned and returned with his family to the U.S. Stan had done an excellent job during a very frustrating period. He was replaced by Bill Cyphers, a Research Associate in the Instrumentation Lab in Aerospace Engineering. Bill's background in the construction and maintenance of equipment used in ionospheric research in Greece, Japan, Greenland, and the Bahamas while in the U.S. Navy suited him admirably to the task.

The installation of the computer took place in August, 1979, We were most fortunate to have Dr. Michel Glass of CNET available at this time. He arranged to vacation with his family in Puerto Rico, and spent most of this vacation in the receiver trailer. He worked for ten days with Bill preparing the trailer, before the principal investigator arrived with the computer on August 22. Without Dr. Glass' assistance, and his intimate knowledge of the French system, the computer installation would have taken months instead of weeks.

Unfortunately, final system checkout was delayed by Hurricane David. With both Dr. Glass and the principal investigator obliged to leave because of other commitments, Bill proceeded to clean up the (fortunately) minimal damage. The trailers were unscathed. The four uprooted antennae were able to be repaired in the field. The infrasound equipment did not fare as well. Bill had to relay cable, and replace sensors, and repair amplifier input circuitry destroyed by lightning.

The last "bug" had almost been removed from the system when, in October, a lightning strike on the power lines destroyed some 30 integrated circuits and a fistful of switching diodes in the radar controller, as well as the direct memory access circuitry of the computer. No sooner was this damage repaired, than the U.S. Coastguard, which had obtained possession of the transmitter site from the Navy, requested the removal of the transmitter trailer and antennae. With the considerable help of Arecibo Observatory personnel, the Federal Aviation Administration, and the Puerto Rican Industrial Development Organization, a new site near Gate 5 of Ramey was identified and, with Coastguard help, the equipment was moved. By the time power was connected, and the new site fenced, it was not until March 1980, that preliminary runs to determine system performance were resumed. The first reliable data was recorded in April, and was sent to CNET for assessment.

1.4 Routine Operation of the Ramey Radar

The aim of this project was to continuously record measopause level winds over Ramey, Puerto Rico. During 1980, continuous records were obtained for the periods:

May 15	-	June 11
August 11	-	August 23
October 6	-	October 15

Winds produced from these data are presented in Section 2.

Two major problems have arisen in attempting to maintain continuous operation of the system. Frequent "brownouts", power outages and lightning strikes not only resulted in lost data, but also in equipment failure. Maintenance of an equitable temperature and humidity environment requires continuous air conditioning of the receiver trailer. "Brownouts" have caused air conditioning failures and, because of lack of availability of replacemnt parts, have taken time to fix. Problems with the computer related to both power and environment, coupled with distance from the nearest field representative (in San Juan) have also resulted in considerable downtime.

Contamination of data by F region backscatter folding back into the acceptable echo range gate has resulted in a marked decrease in useable echo rate. This interference is decreasing as sunspot activity decreases. Incorrect sampling of the receiver noise levels also resulted in data loss because of an apparently low signal to noise ratio. This fault has been rectified.

2. Results

The results produced by the CNET meteor radar at Ramey, Puerto Rico, represent the first concerted attempt to obtain regular measurements of equatorial mesopause level dynamics since that made by the Soviet Union over Somalia (Africa) in the late 1960's (Babadzhanov et al., 1970). The preliminary results presented here have been produced by the application of the wind analysis of Groves (1959). Each continuous run is broken down into intervals ranging in length from two to eight days, depending on acceptable echo rate. A third order polynamical (cubic) variation with height for the mean zonal wind, and for the amplitudes and phases of the diurnal and semidiurnal zonal wind components, was found in all cases to provide the best fit of the Grove's model to the data.

It should be noted that these are preliminary results only - contamination of the meteor echoes by F region backscatter has proved to be a problem during this sunspot maximum; attempts are being made to devise a better signature recognition and echo processing algorithm to minimize the effects of this interference on the results.

2.1 Results for May 15 - June 11, 1980

The wind results for the intervals

May 15 - 22
May 22 - 29
May 29 - June 2
June 2 - June 6
and June 6 - June 11

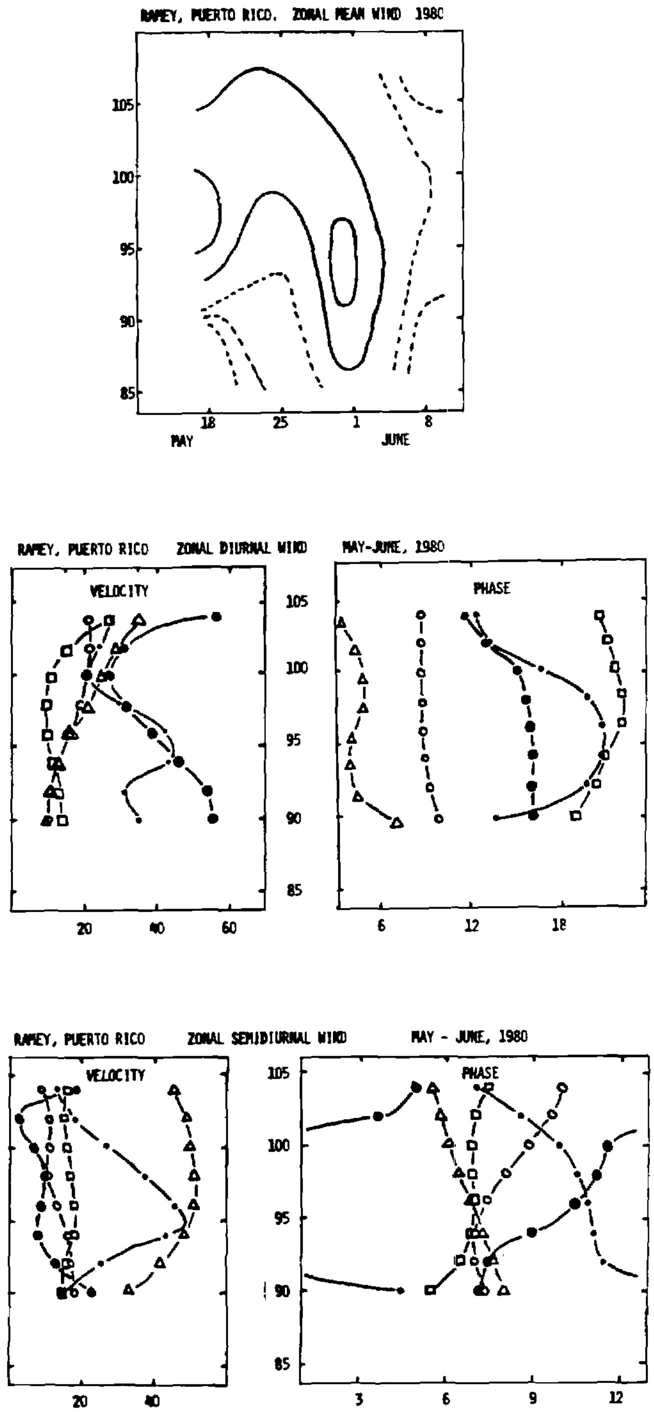


Figure 1. Ramey radio meteor wind results for May 15 - June 11, 1980. Zonal mean wind countours are plotted at 20m sec^{-1} intervals, with the full contours representing eastward flow (westerly wind).

•	May 15 - 22
O	May 22 - 29
Δ	May 29 - June 2
◻	June 2 - 6
•	June 6 - 11

are shown in Figure 1.

The structure with both height and time of the zonal mean wind over the four week interval shows a variation in keeping with the existence of synoptic "weather" at these altitudes, in keeping with similar results from mid latitudes.

The vertical structure of the diurnal wind is highly variable also, in keeping with mid latitude measurements, while the phase (local mean solar hour of maximum eastward amplitude) shows a monotonic decrease with time, which could be interpreted as measurement of a periodic wind with a period closer to 23 than 24 hours. Note that amplitudes as high as 60m sec^{-1} are observed, a common feature of the equatorial mesopause level circulation.

The variation with time of the semidiurnal wind amplitude could possibly be coupled with the synoptic "weather" indicated by the zonal mean, but its phase variation would favor mode changes. May 15-22 and May 29-June 2 evidence decreasing phase with height (upward propagation), while the other intervals are characterized by a phase increase with height, possibly indicating an energy source in the thermosphere above.

2.2. Results for August 11-23, 1980

This somewhat shorter interval again reveals the complexity of the dynamics of this region. The zonal mean is predominantly westward, modified by the presence of a short lived eastward cell at 90km, and a longer lived eastward flow above 100km.

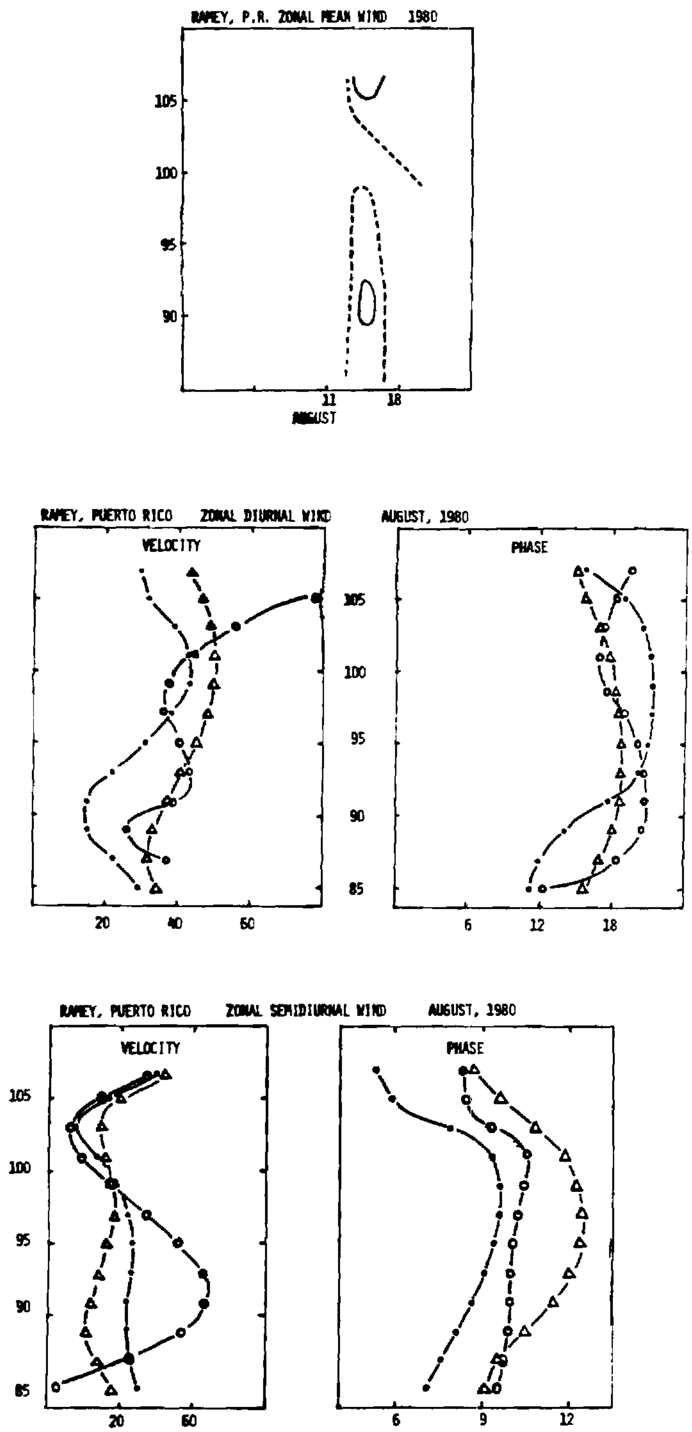


Figure 2. As for Figure 1, for August 11-23, 1980

•	August 11 - 13
0	August 13 - 16
Δ	August 16 - 23

In contrast with the May - June 1980 results, the diurnal wind is less variable. The relatively constant phase with height would indicate the presence of a basically evanescent mode over this interval.

The semidiurnal wind amplitude is again characterized by a waxing and waning, particularly at the 92km level. The minimum in amplitude at 103km are all associated with a retardation of phase with heights of some 2 to 3 hours.

2.3. Comparison of the Results of 2.2 with Arecibo Observations

Figure 3 presents D region wind measurements made by a group from the Japanese Radio Atmospheric Science Center, University of Kyoto (under Dr. S. Kato) using the 430MHZ radar and the 300m dish at Arecibo. This is an application of a technique developed by Dr. John Mathews (Case Western Reserve University) and Dr. S. Ganguly for the measurement of D region drifts, and is applicable around noon when D region electron densities are high enough to produce scatter returns. Several profiles of the zonal wind are produced each hour, and hourly means have been compared with those measured by the Ramey meteor radar (see Appendix II).

The complexity of the dynamics of the equatorial mesopause are well illustrated by Figure 3. In addition to considerable height structure at a given time, day by day variations are obvious - for example, there is a complete reversal of the wind pattern at 90km between August 2 and 3, with the August 2 pattern returning on

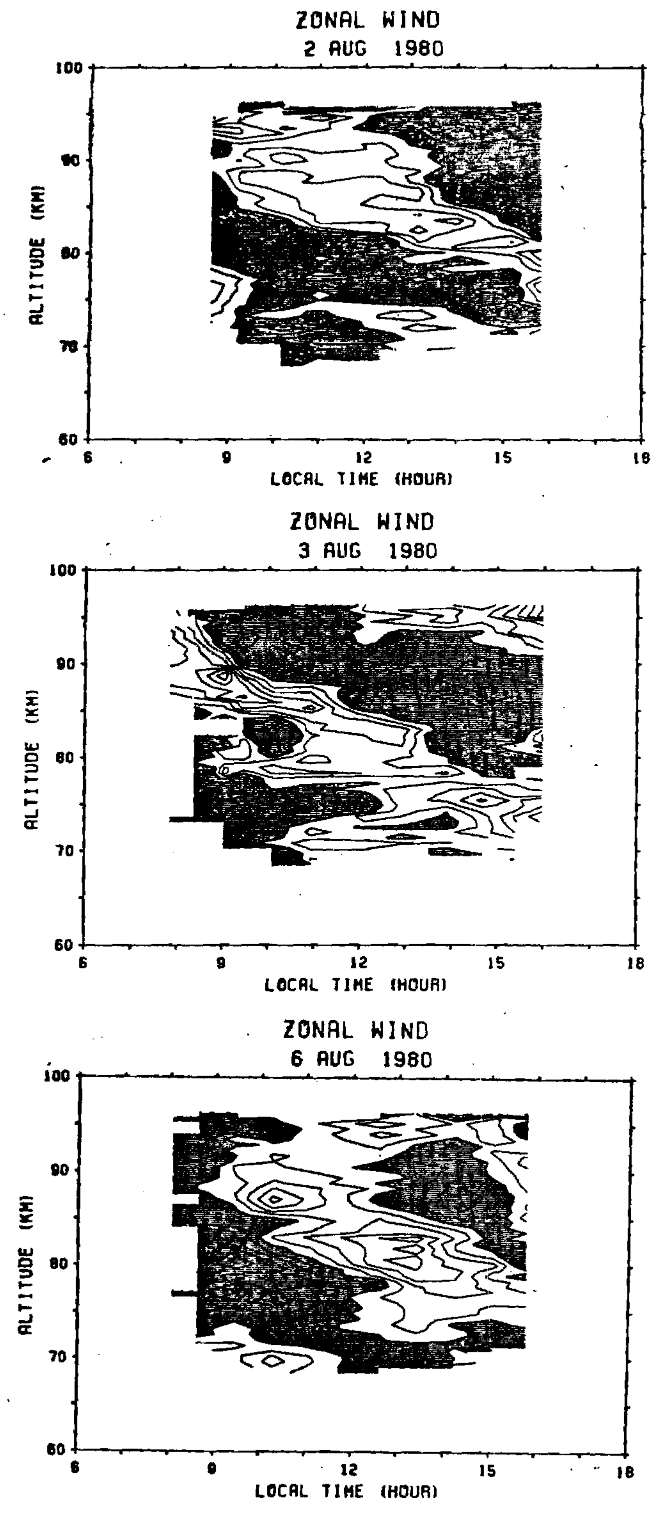


Figure 3. Hour by hour zonal wind values measured by the Arecibo 430MHZ incoherent scatter radar for the days and time shown. Contours are at 10m sec^{-1} intervals, shaded areas represent eastward flow (westerly wind).

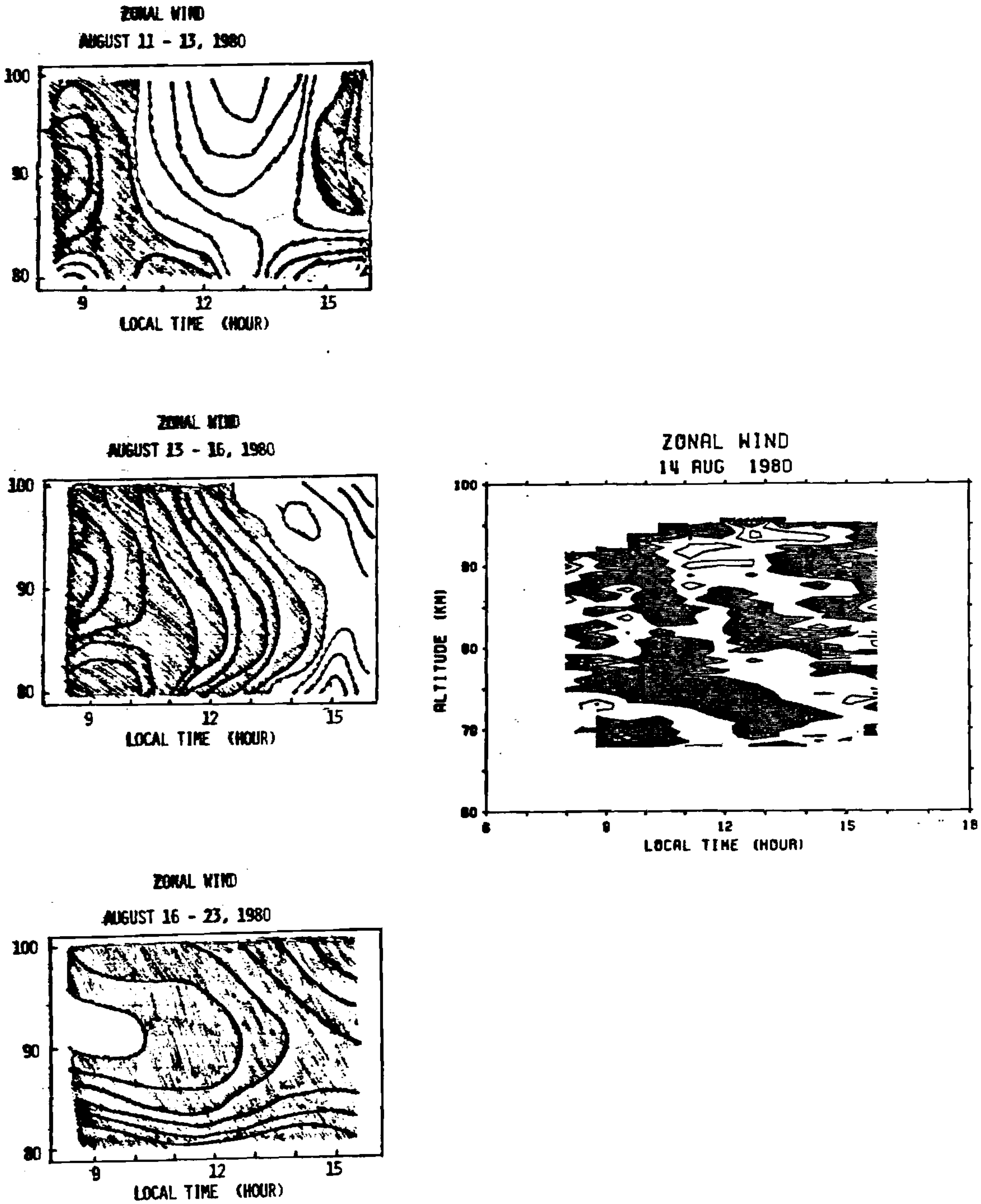


Figure 4. Plots on the left are the result of compounding the mean, diurnal and semidiurnal components as determined by the Ramey meteor wind radar; on the right, as for Figure 3.

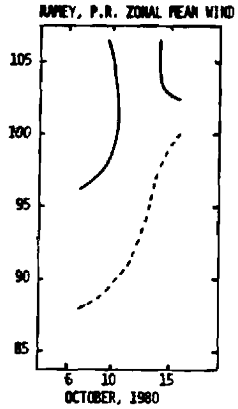
August 6. It is a pity that days 4 and 5 are missing, but nevertheless one would guess that such a time dependence might result from the presence of a 2 day wave (which has been well documented as appearing in summer at mid latitudes, and had been seen previously by the French at Ramey in August '77).

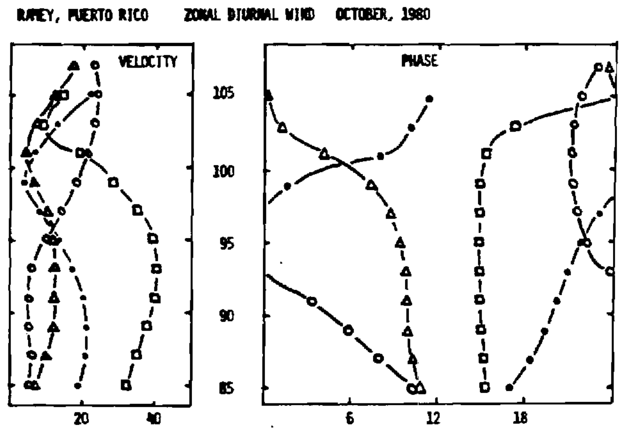
In Figure 4 we see a comparison between the radio meteor winds reconstructed from the zonal mean, dirunal and semidiurnal winds as averaged over the three intervals indicated, and the total zonal wind measured by the Arecibo radar from 0830 to 1600 hours local time. Note that the meteor results could have been plotted for the full 24 hours of the "typical day" within each interval, but have been restricted to the around noon period for ease of comparison with the Arecibo results.

A pattern closely approximating the gross features of the Arecibo measurement on August 14 is indicated in the relatively highly smoothed progression of meteor wind results. An attempt is being made to subtract the mean plus tidal components as determined by the meteor radar from the Arecibo results (attempts to extract the tides from the 7 hours of Arecibo data have not proved fruitful) in order to isolate the short-period (gravity wave) component.

2.4. Results for October 6-15, 1980

During this period, the zonal mean gradually changed from westerly to easterly flow (see Figure 5).





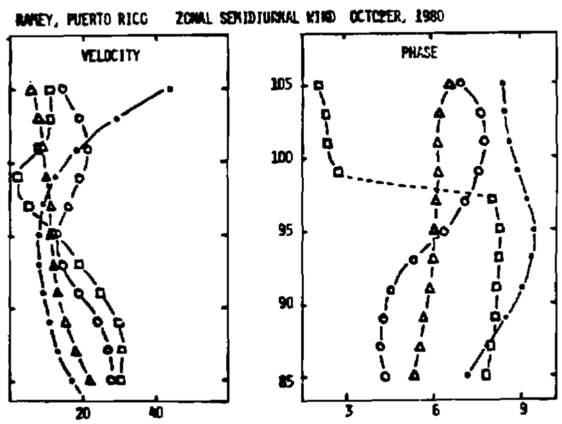


Figure 5. As for Figure 1, for October 6-15, 1980.

•	October 6 - 10
O	October 10 - 11
Δ	October 11 - 13
◻	October 13 - 15

The diurnal wind amplitude underwent a large change toward the end of the observation interval with a node in amplitude and phase change at 103 km, consistent with a reflection from above.

This reflection is even better established in the semidiurnal wind in the same October 13-15 interval. The node in amplitude occurs at 98 km, with a complete (6 hour) reversal in phase at this altitude. Further observations of this type could lead to a better understanding of thermospheric models, which could be "tweaked" to produce the measured reflections by varying the model temperature profiles and wind fields.

3. Future Operations

In addition to results reported here, data has been gathered from February 24 - May 1, 1981, and represents the longest interval of equatorial mesopause level dynamics data ever collected. Final wind analysis of this data is not yet complete.

Inability to find a full or even part time replacement for Bill Cyphers when he returned from Ramey to Atlanta in July, 1981, has necessitated the proposal of a campaign schedule for 1981-82.

The first campaign will be from November 10 through November 25, 1981, to coincide with measurements being made at Jicarmarca, Peru by the University of Kyoto Radio Atmospheric Research Center, and at Arecibo (using VHF scatter) by the Max Planck Institute, Lindau. This period has been designated as a global measurement interval by IAGA's Global Radio Meteor Wind Studies Project and the URSI/IAGA Cooperative Tidal Observations Program.

Campaigns have also been scheduled for

February 12 - 22, 1982
April 9 - 19, 1982
and June 11 - 21, 1982.

These campaign intervals have been chosen with due regard to the 1982 GRMWSP/CTOP Calendar.

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APPENDIX I

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APPENDIX II

DYNAMICS OF THE EQUATORIAL MESOPAUSE

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ABSTRACT

Until recently, our view of the neutral atmosphere dynamics of the equatorial mesopause has been restricted to "snapshots" resulting from either one time campaigns, or intermittent observations. Rockets flown from Brazil, the "big gun" launches from Barbados, meteor wind radar data from Somalia and Jamaica, and VHF radar observations from Peru, while producing much information on the nature of motions with periods of up to a day, provided only meager details of the synoptic seasonal meteorology of the region. More recent observations have resulted from the extension to lower altitudes of the incoherent scatter technique at Arecibo, the installation of a partial reflection drift station at Townsville, Australia, and the establishment by the French of a meteor wind radar at Ramey, Puerto Rico. The incoherent scatter and partial reflection facility operate in the "campaign" mode while the French meteor radar is operating continuously.

Because of the limited amount of synoptic data available, this review concentrates on results produced by those techniques most likely to be used for synoptic observations in the future. However, since even these promising techniques may not be able to be used in other than a campaign mode (for reasons ultimately financial), a rationale for their use in winter months (on the basis that northern hemisphere winter polar stratospheric warmings are probably a global phenomenon at mesopause altitudes) is presented.

INTRODUCTION

Many observational techniques have been used to measure winds at mesopause heights over the tropics - chemical trails from projectiles launched by the "big gun" on Barbados (Murphy, et al., 1966), rocket grenades over Natal, Brazil (Groves, 1974), radio meteor measurements over Somalia (Babajamov, et al., 1970), and Jamaica (Alleyne, et al., 1974, Scholefield and Alleyne, 1975), VHF radar observations (Woodman and Guillen, 1974), and incoherent scatter observations (Mathews, 1976; Harper, et al., 1980). More recently, a partial reflection drift station has been set up at Townsville, Australia by the Department of Physics of the University of Adelaide (Dr. R. A. Vincent), and a meteor radar by the French National Center for Telecommunications Studies (Dr. M. Glass) at Ramey, Puerto Rico. The various techniques have been reviewed most recently by Woodman (1977) and Evans (1978).

Woodman places particular emphasis on equatorial measurements and the need for more observational data. His paper at this meeting concentrates on small scale structure (gravity waves and turbulence), and so this present work will confine itself to tidal and planetary waves and the prevailing winds.

OBSERVATIONS

To date, all observations of winds at the mesopause level over the equator have been of the "snapshot" variety, with a few days of observation, very occasionally repeated seasonally. (The same can also be said for other latitudes, with the exception of the meteor radar network in the U.S.S.R. operated by the Hydrometeorological Service, which operates continuously, but unfortunately does not measure wind structure with height.) These "snapshots" have revealed considerable variability in the winds, but with indications of predominant easterlies at the equator, in contrast to the predominantly westerly flow observed at mid latitudes.

RADIO METEOR WINDS

An example of one of these observations, obtained by a collaborative effort between the French National Center for Telecommunications Studies, and the Georgia Institute of Technology, using the French meteor radar located at Ramey, Puerto Rico (18°N), is presented in Figure 1. The zonal wind component of Figure 1a is predominantly easterly (wind vector directed toward the west), for the first four days of observation, but a strong westerly intrusion then develops from above. The intrusion weakens and ascends toward the end of the observational period. While this phenomenon can be associated with the simultaneous spring reversal of the zonal stratspheric circulation, it may also be evidence for the mean flow acceleration by tidal interaction proposed by Miyahara (1979) - as can be seen from Figures 1b and c, both the

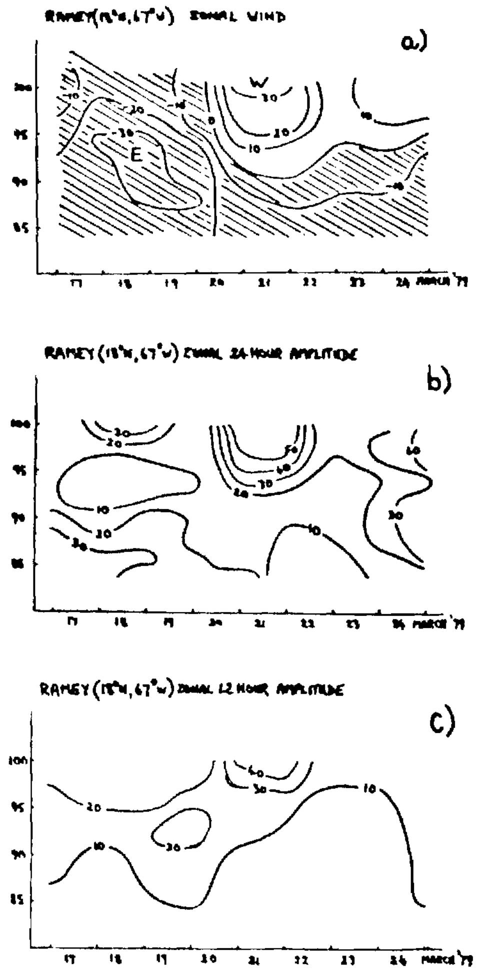

Figure 1. Radio meteor winds from 85 to 105 km for the period March 17-24, 1979, over Puerto Rico. a) zonal wind; b) 24 hour tidal amplitude; c) 12 hour tidal amplitude.

diurnal and semidiurnal tidal amplitudes have large amplitudes coinciding with the reversal.

One phenomenon which has received considerable attention at middle latitudes is the 2 day wave, which has been observed in week to 10 day meteor radar winds in both the northern and southern hemisphere. By using a low pass filter to remove periods shorter than 30 hours from 8 days of meteor wind radar data obtained at Ramey in August-September 1977, Glass (private communication, 1978) produced the results shown in Figure 2. The presence of a wave with a quasi-2 day period is well illustrated.

INCOHERENT SCATTER WINDS

Some recent results from Harper, et al. (1980), taken using the Arecibo incoherent scatter radar from September 1 to 14, 1977, are shown in Figure 3. The 14 noontime profiles illustrate the variability encoun-

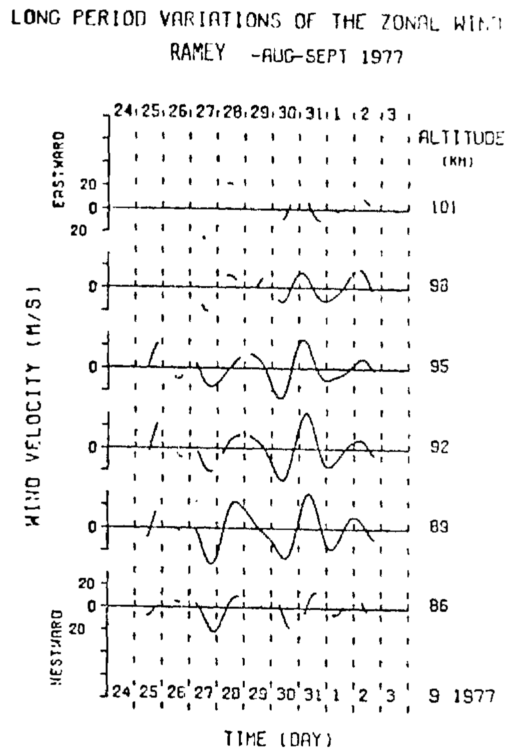

Figure 2. Radio meteor winds - long period variations.

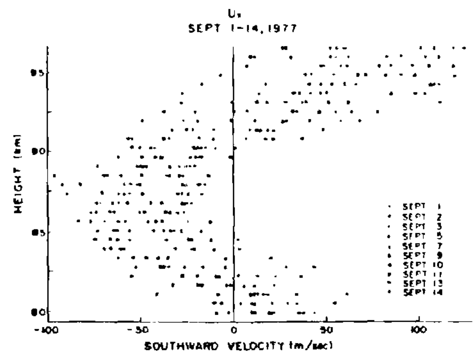

Figure 3. Meridional winds from the Arecibo incoherent scatter radar (from Harper, et al., 1980).

tered in winds at the mesopause level. Note that these are meridional winds and that speeds of ±100 m/sec occur - zonal and meridional wind speeds are comparable at altitudes above the mesopause, in contrast to the predominantly zonal flow in the stratosphere and mesosphere below.

METEOR/INCOHERENT SCATTER WIND COMPARISONS

Mathews, et al. (1980) presents several comparisons between meteor winds from the

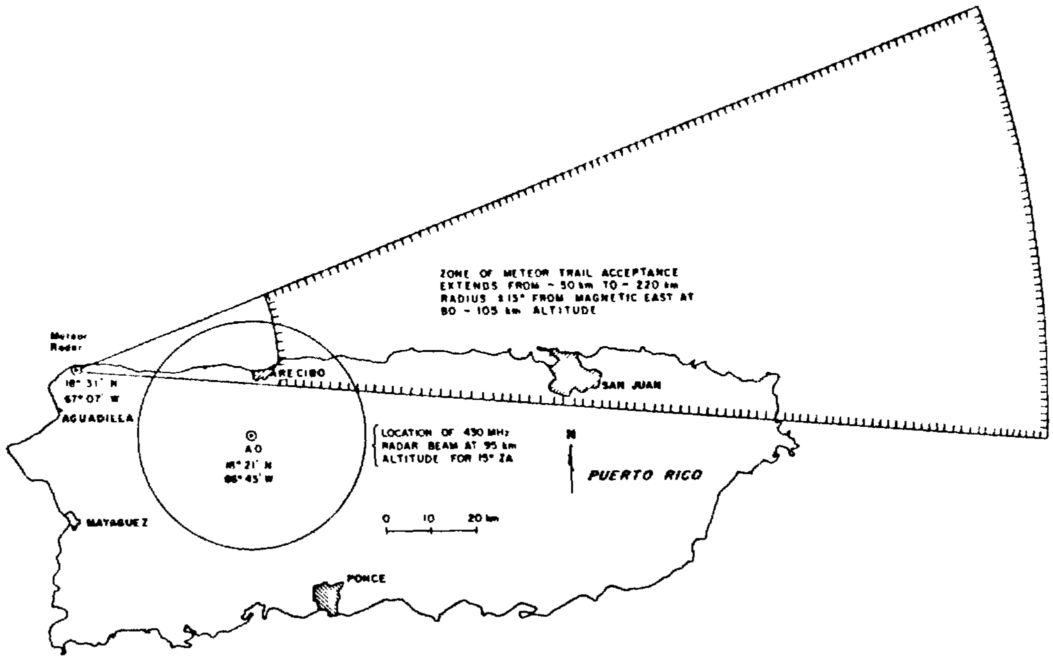

Figure 4. Location and sampling regions of Ramey meteor and Arecibo incoherent scatter radars (from Mathews, et al., 1980).

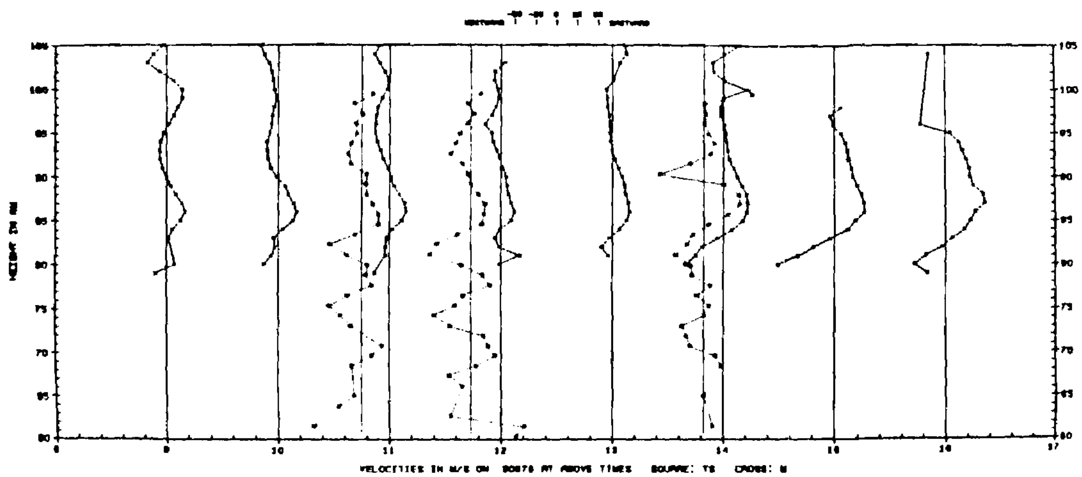

Figure 5. Comparison between Arecibo incoherent scatter radar winds (dashed lines) and Ramey meteor radar winds (full lines), August 3, 1978 (from Mathews, et al., 1980).

French radar at Ramey and winds from the incoherent scatter radar at Arecibo. The locations and "zones of echo acceptance" of the two instruments are shown in Figure 4. One comparison, from 0900 to 1600 hours on August 3, 1978 (Figure 5), shows quite good agreement between the two techniques, with the incoherent scatter winds showing more structure because of better height resolution. Between 1000 and 1400 hours, the incoherent scatter winds are significant down to 60 km - a real breakthrough when one remembers that just a few years ago 110 km was the lower limit of reliable wind measurement using this technique. However, there are no incoherent scatter winds below 100 km at night, whereas the radio meteor technique produces winds over the 80 to 100 km height range both day and night.

PARTIAL REFLECTION DRIFTS

This relatively inexpensive technique is capable of measuring winds between 60 and 100 km by day, and 90 to 100 km by night. The first partial reflection drifts experiment operating on a routine basis was installed at

Townsville, Australia (20°S) by Dr. R. A. Vincent of the University of Adelaide, Australia. This equipment is capable of continuous operation, but for financial reasons is run in the campaign mode. Results from this experiment are eagerly awaited.

VHF SCATTER RADARS

The most recently developed tool capable of continuous monitoring of mesopause dynamics is the VHF Scatter Radar. These radars have the capability, shared by the partial reflection drift technique, of measuring periodicities in wind profiles down to the Brunt Vaissala, and therefore represent powerful tools for gravity wave and turbulence studies, in addition to planetary waves, mean winds and tides. Details of this technique are to be presented at this meeting by Ben Balsley.

AIRGLOW DRIFTS AND TEMPERATURES

While unable to provide continuous measurements (nighttime only, no clouds), airglow measurements can supplement our knowledge of winds (see, for example, Hernandez and Roper, 1979) and provide temperature data of use in modeling mesopause dynamics.

POLAR STRATWARM EFFECTS AT MESOPAUSE HEIGHTS

The necessity for continuous monitoring of mesopause dynamics is illustrated in Figure 6 (from Roper, 1978). Without

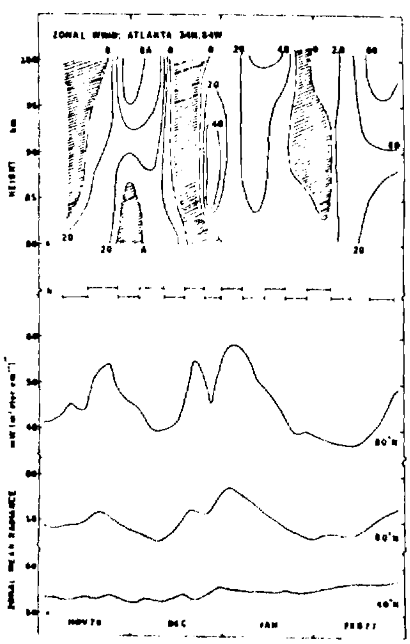

Figure 6. Comparison between zonally averaged satellite radiance data and the zonal wind at meteor heights over Atlanta (from Roper, 1978).

continuous data, the association between the polar winter stratospheric warming and the reversal in the zonal wind at mesopause altitudes would not be nearly as convincing. While this data is for mid-latitudes (Atlanta, 34°N), the effect is so pronounced that it would not be surprising if it extends as far south as Puerto Rico (18°N).

CONCLUSIONS

No mention has been made here of satellite remote sensing to monitor meospause dynamics. Because winds at these altitudes are ageostrophic, conversion of temperature fields to winds is well nigh impossible. For many years to come, and certainly through the Middle Atmosphere Program period, 1982-85, ground based radio techniques will be our primary source of data on mesopause dynamics at all latitudes.

ACKNOWLEDGEMENTS

Radio meteor winds from Ramey have been measured by the French National Center for Telecommunications Studies, and, under a grant from the Atmospheric Research Section (Aeronomy) of the National Science Foundation, by the Georgia Institute of Technology. Preparation of this paper has been supported by the Planetary Atmospheres Branch of the National Aeronautics and Space Administration. The Arecibo Observatory is funded by the National Science Foundation through a grant to Cornell University.

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added in proof:

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Appendix III

The Data Acquisition Computer Program

The Ramey radar is computer controlled, with echo recognition, preliminary data reduction, and digitization being performed in real time. Each echo which satisfies the recognition criteria is then written digitally on magnetic tape. A single 2400 foot tape can hold 5,000 digitized echoes, and will need to be changed every 5 to 10 days, depending on the echo rate. Calibrations are also performed automatically at a pre-selected interval (usually every 90 minutes) and the results are also taped. The program keeps a running count of echo statistics, including reasons for rejection, and these are available on the online printer at the push of a button. The statistics are also dumped to tape before every (operator selected) end of file. The programs are written in FORTRAN and Hewlett Packard Assembly Language, compiled under HP-BCS, and written to magnetic tape. The computer system in the field is mag. tape based, and consists of:

HP2108 minicomputer, with 32K memory and DMA
HP7970B magnetic tape drive, for program loading (with Internal Binary Loader ROM in the 2108) and data writing
HP2635A printing terminal, for interactive I/O
HP5610 analog to digital converter, for digitization of 8 channels of echo data.

Various IO boards in the main frame accept output from a digital clock for echo times of occurance, provide signals to initiate and control the calibration procedure, and monitor the system performance. All software used, with the exception of the power fail

subroutine, was provided by the Groupe Radar Meteorique, Centre Nationale d'Etudes de Telecommunications, France, and has undergone only minor modification to make it compatible with magnetic tape, rather than paper tape, program and diagnostic input.
The program consists of

MAIN PROGRAM SUPVS

and Subroutines

MINIT	COREC	CODE
TRAIT	COMP	TBGIO
VISU	AMPLI	RCEOF
ETAL	TRANS	TEMPO
MESUR	IDIST	BYE
ENTRE	IPHAS	WAIT
SORT	STATS	DINIT
ALARM	MAXIM	DCBBI
IDETC	CORFA	INIT
NIMT	CONAD	ALLCO
ITRCO	RAZ	PFAIL

The A/D Converter DMA Driver L5610 must also be loaded

```
FTN4,L
      PROGRAM SUPVS
C     *************
C
C     SUPERVISEUR DE TACHES
C     TASK SUPERVISOR
C
C     IOUT:BUFFER D'ENTREES-SORTIES
C          I/O BUFFER
C     IV:TABLEAU DES 7 NIVEAUX EN VOLTS
C        TABLE CONTAINING 7 AMPLITUDES IN VOLTS
C     I0:    "    DES PHASES 0 DEGRE
C        TABLE CONTAINING ZERO DEGREE PHASES
C     I360: "     DES PHASES 360 DEGRES
C          TABLE CONTAINING 360 DEGREE PHASES
C     IAZ:  "     DES PHASES AZIMUT DES DOUBLETS
C         TABLE CONTAINING AZIMUTH PHASES OF THE DIPOLES
C     IST:  "     DES PHASES SITE DES DOUBLETS
C         TABLE CONTAINING THE ELEVATION PHASES OF THE DIPOLES
C     IZE:ZEROS ELECTRIQUES
C         ELECTRONIC ZEROS
C     IZD:ZEROS DE DISTANCE
C         DISTANCE ZEROS
C     IA:POINTS AMPLITUDES
C        AMPLITUDES OF THE POINTS
C     ICONV:SORTIE DU CONVERTISSEUR A/D DES 7 VOIES
C           OUTPUT OF THE 7 CHANNEL A/D CONVERTER
C     B:POINTS AMPLITUDE EN DBM
C       AMPLITUDES OF THE POINTS IN DBM
C     BRR:BRUIT INSTANTANNE A FFR
C         INSTANTANEOUS NOISE IN FFR
C     IPHI:POINTS DES 5 PHASES
C          POINTS CONTAINING 5 PHASES
C     NECO:NUMERO DE L'ECHO ENTRE 2 ETALONNAGES
C          NUMBER OF ECHOS BETWEEN 2 CALIBRATIONS
C     IRJT:TABLEAU MEMORISANT TOUS LES REJETS
C          TABLE SAVEING ALL THE REJECTS
C     IFIMO:MOYENNE DES 4 PHASES
C           AVERAGE OF 4 PHASES
C
      DIMENSION B(100)
C
      COMMON IOUT(300),IV(7),IO(5),I360(5),IAZ(4),IST(4),
     1IZE(2),IZD(2),IA(100),ICONV(8),IPHI(5,35),
     2NECO,IRJT(12),IFIMO(4),ITR(3),IALF0
      COMMON IRR1,IRR2,IEMAX(4),IKN1,IRR3
C
      EQUIVALENCE (B(1),IOUT(97))
      EQUIVALENCE (BRR,IOUT(297))
C
      WRITE(6,600)
  600 FORMAT(/////,"***** PROGRAMME SUPERVISEUR *****",
     .             /,"*****       JOB CONTROL      *****",
     1/////)
      GO TO 120
```

```
PAGE 0002  SUPVS  4:05 PM  THU.,  5  FEB., 1981

      70 WRITE(6,110)
     110 FORMAT(/,"INIT ECART PHASE***",
        .        /,"INIT PHASE SHIFT***_")
         READ(1,*) IEMAX
         GO TO 500
     120 IEMAX(1)=40
         IEMAX(2)=15
         IEMAX(3)=15
         IEMAX(4)=10
C
     500 CALL RAZ
C
         CALL BYE(1024)
C
         WRITE(6,100)
         READ(1,*) NTASK
         IF (NTASK)250,250,800
     800 IF(NTASK-6) 850,850,60
     850 ITASK=NTASK-1
         GO TO (10,20,20,40,50,70),NTASK
      10 WRITE(6,1)
         IREP=16
C
         CALL ALARM(IREP)
C
         GO TO 200
      20 GO TO(15,25),ITASK
      15 WRITE(6,2)
         GO TO 1000
      25 WRITE(6,3)
C
    1000 CALL MONIT(ITASK,B,BRR)
C
         GO TO 200
      40 WRITE(6,4)
C
         CALL TRAIT
C
         GO TO 200
      50 WRITE(6,5)
C
         CALL VISU
C
     200 WRITE(6,300)
         GO TO 500
     250 WRITE(6,350)
C
         REWIND 10B
C
         STOP 7777
C
      60  WRITE(6,400)
         GO TO 500
     100 FORMAT(//,"QUELLE TACHE VEUX-TU EFFECTUER*** ",
        .         /,"WHAT TASK IS TO BE PERFORMED*** _")


PAGE 0003  SUPVS  4:05 PM  THU.,  5  FEB., 1981

       1 FORMAT(//,"##### MAINTENANCE DE LA CHAINE DE RECEPTION",
        1" #####",
        .         /,"##### RECEIVER MAINTENANCE #####")
       2 FORMAT(//,"##### DEPOUILLEMENT TEMPS DIFFERE #####",
        .         /,"##### OFF LINE DATA REDUCTION #####")
       3 FORMAT(//,"##### DEPOUILLEMENT TEMPS REEL #####",
        .         /,"##### REAL TIME DATA REDUCTION #####")
       4 FORMAT(//,"##### TRAITEMENT DES DONNEES #####",
        .         /,"##### TREATMENT OF THE DATA #####")
       5 FORMAT(//,"##### GESTION DE LA BANDE NUMERIQUE #####",
        .         /,"##### MANAGEMENT OF A DIGITAL TAPE #####")
     300 FORMAT(//,"TRAVAIL TERMINE",
        .         /,"STOP WORK")
     350 FORMAT(//,"TRAVAIL TERMINE-AU REVOIR",
        .         /,"STOP WORK - GOOD BYE")
     400 FORMAT(//"ERREUR DANS LE NUMERO DE LA TACHE-RECOMMENCE",
        .         /"ERROR IN THE TASK NUMBER - RESTART")
         END


FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

**  NO WARNINGS **  NO ERRORS **   PROGRAM = 00605      COMMON = 00641
```

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         SUBROUTINE MONIT(NUMER,B,BRR)
C        ******************************
C
C        MONITEUR DE DEPOUILLEMENT
C        MONITORS THE DATA REDUCTION
C
C        NUMER=1 TEMPS DIFFERE
C                OFF LINE
C        NUMER=2 TEMPS REEL
C                REAL TIME
C        IER:ETALONNAGES DE REFERENCE EN VOLTS
C            REFERENCE CALIBRATION IN VOLTS
C        JEINF:BORNES INFERIEURES DES ETAL. DE REFERENCE
C              LOWER LIMIT OF THE REFERENCE CALIBRATION
C        JESUP:BORNES SUPERIEURES
C              UPPER LIMIT OF THE REFERENCE CALIBRATION
C        IEP:ETALONNAGES DE LA SERIE PRECEDENTE
C            CALIBRATION OF THE PREVIOUS RUN
C        JET.VOIES A MULTIPLEXER POUR LE TEMPS REEL
C            MULTIPLEXEP CHANNELS FOR REAL TIME DATA REDUCTION
C        ITROU: =1 SI ECHO RECONNU APRES TOUS LES TESTS
C                  IF AN ECHO IS ACCEPTED AFTER ALL THE TESTS
C        IFLAG: =1 CODE 14 PENDANT OU JUSTE APRES UN ETAL.
C                  CODE 14 DURING OR JUST AFTER A CALIBRATION
C
         DIMENSION IER(17),JEINF(17),JESUP(17),IEP(19),
        1JET(29),B(100)
C
         COMMON IOUT(300),IV(7),IO(5),I360(5),IAZ(4),IST(4),
        1IZE(2),IZD(2),IA(100),ICONV(8),IPHI(5,35),
        2NECO,IRJT(12)
         COMMON IBAFE(8),IRR1,IRR2,IEMAX(4),IKH1,IRR3
C
         WRITE(6,300)
     300 FORMAT(//,"MONTE LA BANDE",
        .        /,"MOUNT THE TAPE")
         WRITE(6,5000)
    5000 FORMAT (// " PRESS RUN WHEN READY")
C
         PAUSE 1
C
C        INIT DES ECARTS PHASES
C        INITIALIZE THE PHASE SHIFTS
C
         NECO=0
         IDEB=0
C
         CALL ENTRE(NUMER)
C
         WRITE(6,301)
     301 FORMAT(//,"AFFICHE L'HEURE",
        .        /,"SET THE HOUR")
C
         CALL ALLCO(0)
C
```

```
PAGE 0005  MONIT  4:05 PM  THU.,  5  FEB., 1981

         WRITE(6,299)
     299 FORMAT("DEMARRE L'ALLCO",/,
        .        "SWITCH ON THE ALLCO")
         GO TO (3001,3003),NUMER
    3001 WRITE(6,3100)
    3100 FORMAT("DEMARRE LE MAGNETOPHONE",/,
        .        "SWITCH ON THE TAPE RECORDER")
    3003 WRITE(6,5000)
C
         PAUSE 1
C
         VALFO=IOUT(15)
         N0=IOUT(8)
         N1=IOUT(9)
         NPRIM=IOUT(10)
         L1=IOUT(11)
         L2=IOUT(12)
         L3=IOUT(13)
         IPTN0=IOUT(14)
C
C        SORTIE DU BLOC DE TETE
C        OUTPUT A HEADER BLOCK
C
         IOUT(1)=0B
C
         CALL SORT
C
C        RAZ DES COMPTEURS STATISTIQUES
C        ZERO THE STATISTICAL COUNTERS
C
         DO 302 I=1,12
     302 IRJT(I)=0
C
C        INITIALISATIONS DE IER ET JET
C        INITIALIZE IER AND JET
C
    1309 IER(1)=150
         IER(2)=105
         IER(3)=70
         IER(4)=20
         IER(5)=-40
         IER(6)=-90
         IER(7)=-150
         DO 1307 I=8,12
    1307 IER(I)=180
         DO 1306 I=13,17
    1306 IER(I)=-180
         IF(NUMER-1) 1397,1397,1308
    1308 DO 1 I=1,7
       1 JET(I)=3
         JET(8)=1
         JET(9)=2
         JET(13)=JET(8)
         JET(14)=JET(9)
         DO 2 I=10,12
```

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```
      JET(I)=I-5
    2 JET(I+5)=JET(I)
      DO 3 I=18,21
    3 JET(I)=6
      DO 4 I=22,25
    4 JET(I)=7
      JET(26)=6
      JET(27)=7
      JET(28)=1
      JET(29)=2
C
C     CALCUL DES FOURCHETTES
C     CALCULATE THE BOUNDS
C
 1397 PFOUR=VALFO/100.
      IVALE=PFOUR*FLOAT(IER(8))
      DO 30 I=1,17
      IF(I-8)31,32,31
   32 IF(NUMER-1)33,33,34
   33 IVALE=IVALE/4
      GO TO 31
   34 IVALE=5
   31 JEINF(I)=IER(I)-IVALE
      JESUP(I)=IER(I)+IVALE
      IEP(I)=IER(I)
   30 CONTINUE
C
C     ZEROS DE DISTANCE
C     ZERO THE DISTANCE
C
      IEP(18)=0
      IEP(19)=0
C
      CALL BYE(0)
C
      GO TO (100,15),NUMER
C
C     RECHERCHE DES ETALONNAGES
C     PERFORM CALIBRATION SEQUENCE
C
  100 IF(ISSW(1)) 65,198
C
  198 CALL CODE(IREP)
C
      IF (IREP-15)35,15,25
C
   25 CALL ALARM(IREP,L1,L2,L3,N0,N1,NPRIM)
C
      GO TO 100
   15 IDEB=IDEB+1
      NT=0
C
   13 CALL ETAL(NUMER,IDEB,IEP,JEINF,JESUP,JET,IFLAG)
C
      IOUT(1)=133333B
```

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```
      IRR1=IOUT(37)
      IRR2=IOUT(38)
      IRR3=IOUT(39)
      IOUT(39)=IOUT(37)+IOUT(38)+IOUT(39)
      IOUT(40)=NECO
      GO TO (16,17),NUMER
   17 IF(IOUT(39)) 11,16,11
   11 IF(NT-2) 14,18,14
   18 WRITE(6,5000)
C
      PAUSE 7
C
      IF(ISSW(1)) 65,19
   19 IREP=80
C
      CALL ALARM(IREP)
C
      NT=1
   14 NT=NT+1
      GO TO 13
   16 CONTINUE
C
      CALL SORT
C
      IF(IDEB-1) 100,102,103
C
C     CALCUL DE N0,N1,NPRIM AVEC REMISE ECHELLE CAD
C     CALCULATE N0, N1, AND NPRIM WITH THE OLD SCALE CAD
C
  102 CALL PARAM(N0)
C
      CALL PARAM(N1)
C
      CALL PARAM(NPRIM)
C
      AK=511./250.
      N0=FLOAT(N0)*AK
      N1=FLOAT(N1)*AK
      NPRIM=FLOAT(NPRIM)*AK
C
C     RECHERCHE DES ECHOS METEORIQUES
C     SEARCH FOR METEOR ECHOS
C
  103 NECO=0
      IF (IFLAG-1)100,65,100
   35 IF (IREP-14)45,55
   55 IF (IDEB)100,100,65
C
C     SORTIE BLOC FIN DEPOUILLEMENT
C     OUTPUT END OF PROCESSING BLOCK PLUS EOF
C
   65 IOUT(1)=177777B
C
      CALL LIREH(J,IH,M,IS)
C
```

```
      IOUT(14)=J
      IOUT(15)=IH
      IOUT(16)=M
      IOUT(17)=IS
      DO 303 I=1,12
  303 IOUT(I+1)=IRJT(I)
C
      CALL SORT
C
      END FILE 10B
C
      IF(ISSW(1)) 306,307
C
  306 CALL BYE(1024)
C
  307 IF(ISSW(2)) 304,305
C
  304 REWIND 10B
C
  305 WRITE(6,400)
  400 FORMAT(//,"DEMONTE LA BANDE",
     .         /,"DISMOUNT THE TAPE")
      WRITE(6,5000)
C
      PAUSE 3
C
      RETURN
C
   45 IF (IREP)100,75,100
   75 IF (IDEB)100,100,85
C
   85 CALL MESUR(NUMER,NO,N1,NPRIM,L1,L2,L3,IPTNO,ITROU,B,BRR)
C
C     RAZ ALLCO APRES DETECTION
C     RESET THE ALLCO AFTER A RECEPTION
C
      CALL ALLCO(0)
C
      IF(ITROU) 101,100,101
  101 IOUT(1)=155555B
C
      CALL SORT
C
      GO TO 100
      END
```

FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

** NO WARNINGS ** NO ERRORS ** PROGRAM = 01006 COMMON = 00641


```
      SUBROUTINE TRAIT
C     ****************
C
C     HISTOGRAMME CAMPAGNE DE DEPOUILLEMENT
C     PRINT OUT THE REDUCED DATA FOR THIS DATA SET
C
      DIMENSION IOUT1(60),IOUT2(240)
C
      COMMON IOUT(300)
C
      EQUIVALENCE (IOUT1(1),IOUT(1))
      EQUIVALENCE (IOUT2(1),IOUT(61))
C
      WRITE(6,300)
  300 FORMAT(//,"MONTE LA BANDE",
     .         /,"MOUNT THE TAPE")
      WRITE(6,5000)
 5000 FORMAT (// " PRESS RUN WHEN READY")
C
      PAUSE 1
C
      READ(10B)IOUT
      NO=IOUT(5)
      NB=IOUT(7)
 1000 READ(10B) IOUT1
C
      CALL RCEOF(K)
C
      IF(K) 10,10,72
   10 READ(10B) IOUT2
      IF(IOUT(1)-177777B) 13,12,13
   12 WRITE(6,11) NO,NB
   11 FORMAT(//,5X,"BLOC STATISTIQUE,CAMPAGNE ",I5," BANDE ",I5,
     .            /,5X,"STATISTICAL BLOCK,DATA SET",5X," TAPE# ",//)
      WRITE(6,14) (IOUT(I),I=2,11)
      GO TO 1000
   14 FORMAT("ECHOS  DETECTES        =",I7,/,
     .         "ECHOS  DETECTED",/,
     1"REJET  FFR             =",I7,/,
     ."REJECTED FOR FFR",/,
     2"  #    EPSILON         =",I7,/,
     ."REJECTED FOR EPSILON",/,
     3"  #    > 250 KM        =",I7,/,
     ."REJECTED FOR > 250 KM",/,
     4"  #    PHASE D         =",I7,/,
     ."REJECTED FOR PNASE D",/,
     5"  #       #   DV       =",I7,/,
     ."REJECTED FOR PHASE DV",/,
     6"  #       #   AZ       =",I7,/,
     ."REJECTED FOR PHASE AZ",/,
     7"  #       #   ST       =",I7,/,
     ."REJECTED FOR PHASE ST",/,
     8"ECHOS  RECONNUS        =",I7,/,
     ."ECHOS ACCEPTED",/,
     9"POINTS INSUFFISANTS  =",I7,/,
```

34

```
      ."INSUFFICIENT POINTS",/)
   13 IF(IOUT(1)-155555B) 30,1000,30
   30 IF(IOUT(1)-133333B) 31,1000,31
   31 IF(IOUT(1)) 32,1000,32
   32 WRITE(6,2)
    2 FORMAT(//," BLOC ERRONE",
     .           /," BLOCK ERROR")
   72 IF(ISSW(2)) 74,73
C
   74 REWIND 10B
C
   73 WRITE(6,400)
  400 FORMAT(//,"DEMONTE LA BANDE",
     .          /,"DISMOUNT THE TAPE")
      WRITE(6,5000)
C
      PAUSE 3
C
      RETURN
      END
```

FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

** NO WARNINGS ** NO ERRORS ** PROGRAM = 00558 COMMON = 00300


```
      SUBROUTINE VISU
C     ***************
C
C     VISUALISATION DES DONNEES
C     DATA VISUALIZATION
C
C     POSITIONNEMENT BANDE
C     POSITIONING OF THE TAPE
C
      DIMENSION B(100)
      DIMENSION IOUT1(60),IOUT2(240)
C
      COMMON IOUT(300),IBUFE(313),IRJT(12)
C
      EQUIVALENCE (IOUT1(1),IOUT(1))
      EQUIVALENCE (IOUT2(1),IOUT(61))
      EQUIVALENCE (IOUT(97),B(1))
      EQUIVALENCE (BRR,IOUT(297))
C
      WRITE(6,1965)
 1965 FORMAT(//"MONTE LA BANDE"
     .          /"MOUNT THE TAPE")
      WRITE(6,5000)
 5000 FORMAT (// " PRESS RUN WHEN READY")
C
      PAUSE 1
C
      WRITE(6,7)
    7 FORMAT(//,"QUELLE SOUS-TACHE VEUX-TU EFFECTUER***",
     .          /,"WHAT FUNCTION DO YOU WANT PERFORMED*** _")
      READ(1,*)ITASK
      GO TO (1,101,701),ITASK
 1    WRITE(6,8)
    8 FORMAT(//,"TYPE DE POSITIONNEMENT***",
     .          /,"TYPE OF POSITIONING*** _")
      READ(1,*)IREP
      GO TO(3,50),IREP
    3 WRITE(6,1569)
 1569 FORMAT(//,"NOMBRE DE FICHIERS A SAUTER AV OU AR",
     .          /,"NUMBER OF FILES TO SKIP AV OR AR  _")
      READ(1,*) NFICH
C
      CALL PTAPE(10B,NFICH,0)
C
      WRITE(6,5)
    5 FORMAT(//,"BANDE POSITIONNEE DERRIERE UN EOF",
     .          /,"TAPE POSITIONED AFTER AN EOF")
      GO TO 1000
   50 WRITE(6,6)
    6 FORMAT(//,"NOMBRE DE BLOCS EMS A SAUTER EN AV",
     .          /,"NUMBER OF BLOCKS EMS TO SKIP TO AV _")
      READ(1,*)NBLOC
      I=1
   54 READ(10B) IOUT1
C
```

```
      CALL RCEOF(I1)
C
      IF (I1-1)52,51,52
   51 WRITE(6,199)
      GO TO 1000
   52 READ(10B) IOUT2
      IF(I-NBLOC) 53,2
    2 WRITE(6,1966)NBLOC
 1966 FORMAT(//"BANDE PRETE ",5X,I5," BLOCS EN AVANT",
     .        /"TAPE READY  ",10X," BLOCKS FORWARD")
      GO TO 1000
   53 I=I+1
      GO TO 54
C
C     POSITIONNEMENT APRES PANNE SECTEUR
C     POSITIONING AFTER A BAD RECORD
C
  701 WRITE(6,702)
  702 FORMAT(//,"POSITIONNEMENT APRES PANNE SECTEUR",
     .        /,"POSITIONING AFTER A BAD RECORD",//,
     1"NUMERO DU FICHIER EN PANNE",/
     ."NUMBER OF THE BAD FILE _")
      READ(1,*) NOFIC
      WRITE(6,6)
      READ(1,*) NBLOC
  705 IF(NOFIC-1) 703,703,704
C
  704 CALL PTAPE(10B,1,0)
C
      WRITE(6,199)
      WRITE(6,5000)
C
      PAUSE 3
C
      NOFIC=NOFIC-1
      GO TO 705
  703 READ(10B) IOUT1
C
      CALL RCEOF(I1)
C
      IF(I1-1) 706,51,706
  706 READ(10B) IOUT2
      NBLOC=NBLOC-1
      IF(NBLOC) 703,711,703
  711 IOUT(1)=177777B
C
      CALL LIREH(IOUT(14),IOUT(15),IOUT(16),IOUT(17))
C
      DO 710 I=1,12
  710 IOUT(I+1)=IRJT(I)
C
      CALL SORT
C
      END FILE 10B
C
```



```
      WRITE(6,5)
      GO TO 1000
C
C     VISUALISATION
C     VISUALIZATION
C
  101 WRITE(6,140)
  140 FORMAT(//,"LISTING DES BLOCS",
     .        /,"LISTING OF THE BLOCKS")
  114 IF(ISSW(1)) 120,1968
  120 WRITE(6,197)
  197 FORMAT(//,"FIN DE VISUALISATION",
     .        /,"END OF THE VISUALIZATION")
      IF(ISSW(2)) 1964,1000
C
 1964 REWIND 10B
C
      GO TO 1000
 1968 READ(10B) IOUT1
C
      CALL RCEOF(I1)
C
      IF(I1-1) 511,198
  511 READ(10B) IOUT2
      GO TO 115
  198 WRITE(6,199)
  199 FORMAT(//,"EOF DETECTE",
     .        /,"EOF ENCOUNTERED")
      GO TO 1000
  115 IF(IOUT(1)) 105,200,105
  105 IF(IOUT(1)-133333B) 106,300,106
  106 IF(IOUT(1)-155555B) 107,400,107
  107 IF(IOUT(1)-177777B) 133,500,133
  133 WRITE(6,134)
  134 FORMAT(//,"ERREUR D INDICATIF",
     .        /,"ERROR SENSED")
      GO TO 1000
C
C     BLOC DE TETE
C     HEADER BLOCK
C
  200 WRITE(6,201) IOUT(16),(IOUT(I),I=2,15)
  201 FORMAT(///,"**** BLOC DE TETE ****",
     .        /,"**** HEADER BLOCK ****"///,
     1" ANNEE ",I4,3X,I3," JOUR ",I2," HEURE ",I2," MINUTE ",/,
     ." YEAR  ", 10X,    " DAY  ",2X," HOUR  ",2X," MINUTE "//,
     2" CAMPAGNE            =",I4/,
     ." DATA SET "/,
     3" BANDE NUMERIQUE   =",I4/,
     ." DIGITAL TAPE "/,
     4" BANDE ANALOGIQUE  =",I4/,
     ." ANALOG TAPE "/,
     5" NIVEAUX    N0=",I2," DB   N1=",I2," DB   NPRIM=",I2," DB"/,
     ." AMPLITUDES "/,
     6" PLAGES     L1=",I4,"   L2=",I4,"   L3   =",I4,/,
```

```
     ." PHASES "/,
     7" POINTS AMPLITUDE =",I5/,
     ." AMPLITUDE POINTS "/,
     8" FOURCHETTE =",I3," X"/,
     ." BOUNDS ")
      GO TO 114
C
C     BLOC ETALONNAGES
C     CALIBRATION BLOCK
C
  300 WRITE(6,301) (IOUT(I),I=2,6)
  301 FORMAT(///"**** BLOC ETALONNAGE NO  :",I3," ****",
     .          /"**** CALIBRATION BLOCK NO     ****"///,
     1I3," JOUR ",I2," HEURE ",I2," MINUTE ",I2," SECONDE ",/,
     .   " DAY  ",2X," HOUR  ",2X," MINUTE ",2X," SECOND ",/,
     2)
      IF(IOUT(7)-1)303,304,303
  303 WRITE(6,307)
  307 FORMAT(10X," TEMPS REEL ",/,
     .       10X," REAL TIME ")
      GO TO 305
  304 WRITE(6,306)
  306 FORMAT(10X," TEMPS DIFFERE ",/,
     .       10X," OFF LINE ")
  305 WRITE(6,310) (IOUT(I),I=8,40)
  310 FORMAT(/,
     1"NIVEAUX(-2V)  N1=",I4," N2=",I4," N3=",I4," N4=",I4,
     2" N5=",I4," N6=",I4," N7=",I4,/,
     ."AMPLITUDES(-2V)",//,
     3"PHASES 0 (-2V)  D=",I4,"  DV=",I4,"  AZ=",I4,"  ST=",I4,
     4"   V =",I4,/,
     ."ZERO PHASES(-2V)",/,
     5"PHASES 360      D=",I4,"  DV=",I4,"  AZ=",I4,"  ST=",I4,
     6"   V =",I4,/,
     ."360 DEGREE PHASES",//,
     7"DOUBLETS AZ(D)  F=",I4,"  H=",I4,"  D=",I4,"  G=",I4,/,
     ."DIPOLES",/,
     8 "   ''     BT     F=",I4,"  H=",I4,"  D=",I4,"  G=",I4,/,
     ."DIPOLES",//,
     9"ZEROS ELECTRIQUES(D)    AZ=",I4,"   ST=",I4,/,
     ."ELECTRONIC ZEROS(D)",/,
     1"  ''  DISTANCE(KM)        D=",I4,"   DV=",I4,/,
     ."DISTANCE ZEROS(KM)",//,
     2  "REJETS          NIVEAUX=",I5,"     PHASES=",I5,"    TOTAL=",
     3I5,/,
     .   "REJECTS     AMPLITUDES ",5X,"     PHASES ",5X,"    TOTAL "/
     ."ECHOS RECONNUS=",I5,/,
     ."ECHOS ACCEPTED ")
      GO TO 114
C
C     BLOC ECHO
C     ECHO BLOCK
C
  400 WRITE(6,401)(IDUT(I),I=2,6)
  401 FORMAT(///,"**** BLOC ECHO NO :",I4," ****",
```



```
     .          /,"**** ECHO BLOCK #        ****",///,
     11X,I3," JOUR ",I2," HEURE ",I2," MINUTE ",I2," SECONDE ",/,
     .   4X," DAY  ",2X," HOUR  ",2X," MINUTE ",2X," SECOND ",//)
      IF(ISSW(3)) 114,116
  116 WRITE(6,403) (IOUT(I),I=7,76)
  403 FORMAT(" PHASE D ",15(1X,I3),//,"      DV ",15(1X,I3),//,
     2"      AZ ",15(1X,I3),//,"      ST ",15(1X,I3),//,
     3"     DOP ",10(1X,I3))
      WRITE(6,408)(IOUT(I),I=77,86)
  408 FORMAT(9X,10(1X,I3),/)
      WRITE(6,404)(IOUT(I),I=87,90)
  404 FORMAT(" PHASES MOYENNES :   D :",I3,"  DV :",I3,"  AZ :",I3,
     3"  ST :",I3,/,
     ." AVERAGE PHASES ",//)
      WRITE(6,405)(IOUT(I),I=95,96)
  405 FORMAT(" NOMBRE PTS PHASES :",I3,/,
     .       " NUMBER OF PHASE POINTS ",/,
     .       " NOMBRE PTS DOPPLER :",I3,/,
     .       " NUMBER OF DOPPLER POINTS",//)
      WRITE(6,406)IOUT(91),IOUT(94),IOUT(92),IOUT(93)
  406 FORMAT(" NBRE PTS AMPLITUDE :",I3,/,
     .       " NUMBER OF AMPLITUDE POINTS",/,
     .       " RANG DERNIER PT AMPL. :",I3,/,
     .       " STATUS OF THE LAST AMPLITUDE POINT ",/,
     4     " RANG FIN FRONT RAIDE :",I3,/,
     .     " TOO RAPID DECAY STATUS",/,
     .     " DISTANCE (KM) :",I3,/,
     .     " DISTANCE (KM) ",//)
      WRITE(6,604) BRR
  604 FORMAT(" BRUIT FFR : ",F7.2," DBM",/,
     .       " NOISE FFR ",//)
      IF(ISSW(4)) 114,117
  117 WRITE(6,409)
  409 FORMAT("AMPLITUDE",/)
      IKAA=IOUT(94)
      WRITE(6,407)(B(I),I=1,IKAA)
  407 FORMAT(5(2X,F7.2),/)
      GO TO 114
C
C     BLOC FIN DE DEPOUILLEMENT
C     END OF PROCESSING BLOCK
C
  500 WRITE(6,501) (IOUT(I),I=14,17),(IOUT(I),I=2,11)
  501 FORMAT(///,"**** BLOC FIN DE DEPOUILLEMENT ****",/,
     .           "**** END OF PROCESSING BLOCK   ****",///,
     41X,I3," JOUR ",I2," HEURE ",I2," MINUTE ",I2," SECONDE ",/,
     .   4X," DAY  ",2X," HOUR  ",2X," MINUTE ",2X," SECOND ",//,
     5" NBRE D ECHOS DETECTES :",I7,/,
     ." NUMBER OF ECHOS DETECTED",/,
     ." REJETS SUR FIN FRONT RAIDE :",I7,/,
     ." REJECTED FOR TOO RAPID DECAY",/,
     6    " REJETS SUR TEST EPS DIST. :",I7,/,
     .    " REJECTED FOR THE EPSILON DISTANCE TEST",/,
     7" REJETS SUR DIST. SUP. A 250 KM :",I7,/,
     ." REJECTED FOR DISTANCE GREATER THAN 250 KM",/,
```

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      8" REJETS SUR PHASE DIST. :",I7,/,
      ." REJECTED FOR THE PHASE OF THE DISTANCE",/,
      ." REJETS SUR DIST. VERN. :",I7,/,
      ." REJECTED FOR THE DISTANCE VERNIER",/,
      9     " REJETS SUR PHASE AZIMUT :",I7,/,
      .     " REJECTED FOR THE PHASE OF THE AZIMUTH",/,
      .     " REJETS SUR PHASE SITE :",I7,/,
      .     " REJECTED FOR THE PHASE OF THE ELEVATION",/,
      6   ." NBRE D'ECHOS RECONNUS :",I7,/,
      .     " NUMBER OF ECHOS ACCEPTED",/,
      2" NBRE DE POINTS INSUFFISANT :",I7,/,
      ." NUMBER WITH INSUFFICIENT POINTS",///)
       GO TO 114
 1000  WRITE(6,2974)
 2974  FORMAT(//,"DEMONTE LA BANDE SI NECESSAIRE",/,
      .        "DISMOUNT THE TAPE IF NECESSARY")
       WRITE(6,5000)
C
       PAUSE 3
C
       RETURN
       END


 FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

 **  NO WARNINGS **  NO ERRORS **   PROGRAM = 02863      COMMON = 00625


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FTN4,L
      SUBROUTINE ETAL(NUMER,IDEB,IEP,JEINF,JESUP,JET,IFLAG)
C     *****************************************************
C
C     ETALONNAGES
C     CALIBRATIONS
C
C      IFLAG EST UN PARAMETRE DE SORTIE,TOUS LES AUTRES
C            PARAMETRES SONT DES PARAMETRES D ENTREE
C      IFLAG IS AN OUTPUT PARAMETER, ALL OTHERS ARE INPUT
C            PARAMETERS
C     IFLAG=1 CODE 14 PENDANT OU JUSTE APRES UN ETALONNAGE T.DIFF
C             CODE 14 BEFORE OR JUST AFTER A CALIBRATION TIME INTERVAL
C
      DIMENSION IEP(19),JEINF(17),JESUP(17),JET(29),ITEST(13),
     4IVOIE(8),IVAL(8)
C
      COMMON IOUT(300),IV(7),IO(5),I360(5),IAZ(4),IST(4),
     1IZE(2),IZD(2)
C
      CALL LIREH(J,IH,M,IS)
C
      IOUT(2)=IDEB
      IOUT(3)=J
      IOUT(4)=IH
      IOUT(5)=M
      IOUT(6)=IS
      IOUT(7)=NUMER
C
C     RAZ DES COMPTEURS DE REJETS
C     ZERO THE REJECT COUNTERS
C
      DO 144 I=37,39
  144 IOUT(I)=0
C
C     TEST(I)=0 CODE NON APPARU, =1 SINON
C               IF CODE DOESN'T APPEAR, =1 IF IT DOES
C
      DO 15 I=1,13
   15 ITEST(I)=0
      IFLAG=0
C
      CALL BYE(1024)
C
      GO TO (100,200),NUMER
C
C     CAS DU TEMPS DIFFERE
C     THE CASE OF OFF LINE DATA REDUCTION
C
  100 CALL CODE(IREP)
C
      IF(IREP-15) 20,100
   20 IF(IREP) 300,300,30
C
C     TEST SI CODE DEJA TROUVE-SI OUI ON L IGNORE
```

```
C      TEST IF CODE HAS ALREADY BEEN FOUND - IF IT HAS IGNORE IT
C
    30 IF (ITEST(IREP))40,40,100
C
C      IVOIE REPRESENTE LES NUMEROS DES VOIES A ENVOYER
C             A CONAD POUR ETRE MULTIPLEXEES,LE RETOUR
C             SE FAIT DANS IVAL
C      IVOIE CONTAINS THE NUMBERS OF THE CHANNELS TO BE SENT TO
C             CONAD TO BE MULTIPLEXED, THEY ARE RETURNED IN IVAL
C
    40 GO TO(1,2,3,4,3,3,3,8,8,8,8,12,8,14),IREP
     1 IVOIE(1)=1
       IVOIE(2)=3
       IVOIE(3)=5
       IVOIE(4)=6
       IVOIE(5)=7
       IVOIE(6)=0
       GO TO 400
     2 IVOIE(1)=2
       IVOIE(2)=3
       IVOIE(3)=5
       IVOIE(4)=6
       IVOIE(5)=7
       IVOIE(6)=0
       GO TO 400
     3 IVOIE(1)=3
       IVOIE(2)=0
       GO TO 400
     4 IVOIE(1)=1
       IVOIE(2)=2
       IVOIE(3)=3
       IVOIE(4)=0
       GO TO 400
     8 IVOIE(1)=6
       IVOIE(2)=7
       IVOIE(3)=0
       GO TO 400
    12 IVOIE(1)=1
       IVOIE(2)=2
       IVOIE(3)=0
C
   400 CALL CONAD(IVOIE.IVAL,50)
C
       GO TO(101,102,103,104,103,103,103,108,109,109,109,112,
      7113),IREP
   101 IO(1)=IVAL(1)
       IV(1)=IVAL(2)
       IO(5)=IVAL(3)
       IO(3)=IVAL(4)
       IO(4)=IVAL(5)
       GO TO 500
   102 IO(2)=IVAL(1)
       IV(2)=IVAL(2)
       I360(5)=IVAL(3)
       I360(3)=IVAL(4)
```



```
       I360(4)=IVAL(5)
       GO TO 500
   103 IV(IREP)=IVAL(1)
       GO TO 500
   104 I360(1)=IVAL(1)
       I360(2)=IVAL(2)
       IV(4)=IVAL(3)
       GO TO 500
   108 IZE(1)=IVAL(1)
       IZE(2)=IVAL(2)
       GO TO 500
   109 IAZ(IREP-8)=IVAL(1)
       IST(IREP-8)=IVAL(2)
       GO TO 500
   112 IZD(1)=IVAL(1)
       IZD(2)=IVAL(2)
       GO TO 500
   113 IAZ(4)=IVAL(1)
       IST(4)=IVAL(2)
   500 ITEST(IREP)=1
       GO TO 100
C
C      CODE 14 PENDANT ETALONNAGE
C      CODE 14 DURING CALIBRATION
C
    14 IFLAG=1
C
C      TEST SI ETALONNAGES PRESENTS
C      TEST IF THE CALIBRATIONS ARE PRESENT
C
   300 DO 1000 I=1,13
       IF(ITEST(I)) 301,301,302
   301 IF(I-7) 303,303,304
   304 IJ=I-7
       GO TO (88,89,89,89,92,93),IJ
    88 IZE(1)=9999
       IZE(2)=9999
       GO TO 1000
    89 IAZ(IJ-1)=9999
       IST(IJ-1)=9999
       GO TO 1000
    92 IZD(1)=9999
       IZD(2)=9999
       GO TO 1000
    93 IAZ(4)=9999
       IST(4)=9999
       GO TO 1000
C
C      UN CODE TD LE 7 EST ABSENT
C      A CODE OF (TD .LE. 7) IS ABSENT
C
   303 IBOOL=0
       GO TO 307
   302 IF(I-7) 305,305,1000
C
```

```
C     LE CODE TD LE 7 EST PRESENT
C     THE CODE (TD .LE. 7) IS PRESENT
C
  305 IBOOL=1
C
C   IVOIE REPRESENTE L INDICE DES ETALONNAGES DANS
C          LES TABLEAUX IEP,JEINF,JESUP
C   IVOIE REPRESENTS THE INDICES OF THE CALIBRATIONS IN
C          THE TABLES IEP, JEINF, JESUP
C
  307 GO TO (201,202,203,204,203,203,203),I
  201 IVOIE(1)=8
      IVOIE(2)=1
      IVOIE(3)=12
      IVOIE(4)=10
      IVOIE(5)=11
      IVOIE(6)=0
      GO TO 520
  202 IVOIE(1)=9
      IVOIE(2)=2
      IVOIE(3)=17
      IVOIE(4)=15
      IVOIE(5)=16
      IVOIE(6)=0
      GO TO 520
  203 IVOIE(1)=I
      IVOIE(2)=0
      GO TO 520
  204 IVOIE(1)=13
      IVOIE(2)=14
      IVOIE(3)=4
      IVOIE(4)=0
  520 K=0
 521  K=K+1
      IF(IVOIE(K)) 1000,1000,522
  522 L=IVOIE(K)
C
      CALL COMP(IBOOL,L,JEINF,JESUP,IEP)
C
      GO TO 521
 1000 CONTINUE
C
C     TRAITEMENT PARTICULIER DOUBLETS,0 ELECTRIQUES ET DISTANCE
C     TREATMENT OF SPECIAL DIPOLES, ZERO ELECTRONIC AND DISTANCE
C
 3000 DO 1001 I=1,4
      IF(IAZ(I)-9999) 1005,1003
 1005 IAZ(I)=360.*(FLOAT(IAZ(I)-I0(3)))/(FLOAT(I360(3)-I0(3)))
 1003 IF(IST(I)-9999) 1004,1001
 1004 IST(I)=360.*(FLOAT(IST(I)-I0(4)))/(FLOAT(I360(4)-I0(4)))
 1001 CONTINUE
      DO 1002 I=1,2
      IF(IZE(I)-9999) 1006,1002
 1006 IZE(I)=360.*(FLOAT(IZE(I)-I0(I+2)))/(FLOAT(I360(I+2)-I0(I+2)))
 1002 CONTINUE
```



```
      IF(IZD(1)-9999) 1008,1007
 1007 IF(IDEB-1) 1010,1010,1011
 1010 WRITE(6,3010)
 3010 FORMAT(//,"ZERO DISTANCE ABSENT",/,"VALEUR : ",
     .          /,"VALUE : _")
      READ(I,*) IZD(1)
      IZD(1)=IZD(1)*10
      GO TO 1012
 1011 IZD(1)=IEP(18)
      GO TO 1012
 1008 IZD(1)=-2500.*FLOAT(IZD(1)-I0(1))/FLOAT(I360(1)-I0(1))
 1012 IF(IZD(2)-9999) 1009,1013
 1013 IF(IDEB-1) 1014,1014,1015
 1014 WRITE(6,3014)
 3014 FORMAT(//,"ZERO DISTANCE VERNIER ABSENT",/,"VALEUR : ",
     .          /,"VALUE : _")
      READ(I,*) IZD(2)
      IZD(2)=IZD(2)*10
      GO TO 1020
 1015 IZD(2)=IEP(19)
      GO TO 1020
 1009 IZD(2)=-312.5*FLOAT(IZD(2)-I0(2))/FLOAT(I360(2)-I0(2))
      IF(NUMER-I)1020,1020,1019
 1019 DO 1025 I=1,2
      IDIFF=IZD(I)-IEP(I+17)
      IF(IDIFF)1021,1022
 1021 IDIFF=-IDIFF
 1022 IF(IDIFF+30*I-80)1025,1023
 1023 IOUT(39)=IOUT(39)+1
 1025 CONTINUE
C
C     REMPLIR IOUT POUR PREPARER SORTIE SUR MAG-TAPE
C     REFILL IOUT TO PREPARE FOR OUTPUT ON MAG-TAPE
C
 1020 DO 600 I=1,7
      IOUT(I+7)=IV(I)
      IEP(I)=IV(I)
  600 CONTINUE
      DO 601 I=8,12
      IOUT(I+7)=I0(I-7)
      IEP(I)=I0(I-7)
  601 CONTINUE
      DO 602 I=13,17
      IOUT(I+7)=I360(I-12)
      IEP(I)=I360(I-12)
  602 CONTINUE
      DO 603 I=1,4
      IOUT(I+24)=IAZ(I)
      IOUT(I+28)=IST(I)
  603 CONTINUE
      DO 604 I=1,2
      IOUT(I+32)=IZE(I)
      IOUT(I+34)=FLOAT(IZD(I))/10.+0.5
      IEP(I+17)=IZD(I)
  604 CONTINUE
```

```
C
      CALL BYE(0)
C
      RETURN
C
C     CAS DU TEMPS-REEL
C     THE CASE OF REAL TIME DATA REDUCTION
C
  200 CALL CODE(IREP)
C
      IF(IREP-15) 2315,200
 2315 LAMB=40
      ICYCL=10000
      IPCYL=40
      DO 2000 I=1,29
      IL=I+LAMB
      ID=IL/10
      IU=IL-(ID*10)
      ID=ID*256
      IL=IDR(ID,IU)
C
      CALL BYE(IL)
C
C     TEMPORISATION POUR PUPITRE RELAIS ET OEIL
C     WAIT TO CONNECT RELAYS AND READ (A/D CONVERTER)
C
      DO 2524 IPPY=1,IPCYL
C
      CALL TEMPO(ICYCL)
C
 2524 CONTINUE
      IVOIE(1)=JET(I)
      IVOIE(2)=0
C
      CALL CONAD(IVOIE,IVAL,120)
C
      MOY=IVAL(1)
      IF(I-8) 2002,2003
 2002 IV(I)=MOY
      IK=I
      GO TO 2014
 2003 IF(I-10) 2004,2024
 2004 IO(I-7)=MOY
      IK=I
      GO TO 2014
 2024 IF(I-11) 2025,2026
 2025 IO(5)=MOY
      IK=12
      GO TO 2014
 2026 IF(I-13) 2027,2005
 2027 IO(I-8)=MOY
      IK=I-1
      GO TO 2014
 2005 IF(I-15) 2006,2036
 2006 I360(I-12)=MOY
```



```
      IK=I
      GO TO 2014
 2036 IF(I-16) 2037,2038
 2037 I360(5)=MOY
      IK=17
      GO TO 2014
 2038 IF(I-18) 2039,2007
 2039 I360(I-13)=MOY
      IK=I-1
      GO TO 2014
 2007 IF(I-22) 2008,2009
 2008 IAZ(I-17)=MOY
      GO TO 2000
 2009 IF(I-26) 2010,2011
 2010 IST(I-21)=MOY
      GO TO 2000
 2011 IF(I-28) 2012,2013
 2012 IZE(I-25)=MOY
      GO TO 2000
 2013 IZD(I-27)=MOY
      GO TO 2000
C
 2014 CALL COMP(1,IK,JEINF,JESUP,IEP)
C
 2000 CONTINUE
C
      CALL BYE(0)
C
      GO TO 3000
      END
```

FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

** NO WARNINGS ** NO ERRORS ** PROGRAM = 01585 COMMON = 00329

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```
      SUBROUTINE MESUR(NUMER,N0,N1,NPRIM,L1,L2,L3,IPTN0,ITROU,B,BRR)
C     ***************************************************************
C
C     TRAITEMENT DES MESURES
C     TREATMENT OF THE MEASUREMENTS
C
C     ITROU=0 ON RETOURNE DANS MONIT TESTER LES CODES
C             IT RETURNS TO TEST THE CODES
C
C     ITROU=1 ...............APRES
C             AVOIR VERSE UN BLOC ECHO SUR BANDE
C             ...............AFTER
C             AN ECHO BLOCK IS PUT ON THE TAPE
C
      DIMENSION B(100),IPHI(5,35)
C
      COMMON IOUT(300),IBUFE(29),IA(100),ICONV(8),IPHI,
     1NECO,IRJT(12),IFIMO(4),ITR(3),IALFO
C
      ALFA0=0.4
      AIN=15.
      AIV=IBUFE(5)-IBUFE(7)
      IALFO=(ALFA0*AIV)/AIN
      IJ=IDETC(J,N0,N1,L1,L2,L3,NUMER)
      IF(IJ) 100,100,200
  200 ITROU=0
C
      RETURN
C
  100 IJ=NUMT(J,N,IPTN0,NPRIM,K0)
      IF(IJ) 150,150,200
  150 MBAZ=15
      MPBAZ=20
      M=MBAZ
      MP=MPBAZ
      IJ=ITRCO(N,K0,M,J,MP,ID,IPTN0,B,BRR)
      IF(IJ) 300,300,200
  300 NECO=NECO+1
C
      CALL STATS(9)
C
      CALL LIREN(JOUR,IHR,MINUT,ISEC)
C
      IOUT(2)=NECO
      IOUT(3)=JOUR
      IOUT(4)=IHR
      IOUT(5)=MINUT
      IOUT(6)=ISEC
      DO 400 K=1,4
      DO 400 J=1,MBAZ
      J1=(K-1)*MBAZ+J+6
      IF(J-M) 401,401,402
  401 IOUT(J1)=IPHI(K,J)
      GO TO 400
  402 IOUT(J1)=0
```

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```
  400 CONTINUE
      DO 403 J=1,MPBAZ
      J1=4*MBAZ+6+J
      IF(J-MP) 404,404,405
  404 IOUT(J1)=IPHI(5,J)
      GO TO 403
  405 IOUT(J1)=0
  403 CONTINUE
      DO 406 J=1,4
      J1=4*MBAZ+MPBAZ+6+J
  406 IOUT(J1)=IFIMO(J)
      IOUT(J1+1)=IPTN0
      IOUT(J1+2)=K0
      IOUT(J1+3)=ID
      IOUT(J1+4)=N
      IOUT(J1+5)=M
      IOUT(J1+6)=MP
      ITROU=1
      RETURN
      END
```

FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

** NO WARNINGS ** NO ERRORS ** PROGRAM = 00333 COMMON = 00637

```
FTN4,L
      SUBROUTINE ENTRE(NUMER)
C     **********************
C
C     ENTREE DES DONNEES
C     DATA INPUT
C
      COMMON IOUT(300)
      COMMON IBUFE(339),IKN1
C
      WRITE(6,1)
      READ(1,*) IOUT(16),IOUT(2),IOUT(3),IOUT(4)
      WRITE(6,2)
      READ(1,*)IOUT(5)
      WRITE(6,3)
      READ(1,*)IOUT(6)
      GO TO(10,20),NUMER
   10 WRITE(6,4)
      READ(1,*)IOUT(7)
      GO TO 30
 20   IOUT(7)=9999
    1 FORMAT(////,"ENTREE DES PARAMETRES",/,
     .             "INPUT THE PARAMETERS",//,
     .             "DATE DE DEBUT DE CAMPAGNE***",/,
     .             "THE STARTING DATE OF THE DATA SET*** _")
    2 FORMAT(/"NUMERO DE CAMPAGNE***",/,
     .         "THE NUMBER OF THE DATA SET*** _")
    3 FORMAT(/"NUMERO DE BANDE NUMERIQUE***",/,
     .         "THE NUMBER OF THE DIGITAL TAPE*** _")
    4 FORMAT(/"NUMERO DE BANDE ANALOGIQUE***",/,
     .         "THE NUMBER OF THE ANALOG TAPE*** _")
   30 WRITE(6,6)
    6 FORMAT(/"NIVEAUX N0,N1,N' ***",/,
     .         "AMPLITUDES N0, N1, N' *** _")
      READ(1,*) IOUT(8),IOUT(9),IOUT(10)
      WRITE(6,7)
    7 FORMAT(/"PLAGES DE DETECTION L1,L2,L3 ***",/,
     .         "PHASES DETECTED L1, L2, L3 *** _")
      READ(1,*) IOUT(11),IOUT(12),IOUT(13)
      WRITE(6,8)
    8 FORMAT(/"NBRE DE PTS AMPLITUDE***",/,
     .         "NUMBER OF AMPLITUDE POINTS*** _")
      READ(1,*) IOUT(14)
      WRITE(6,9)
    9 FORMAT(/"FOURCHETTE ETALONNAGES % ***",/,
     .         "CALIBRATION BOUNDS % *** _")
      READ(1,*)IOUT(15)
      WRITE(6,19)
   19 FORMAT(/"NIVEAU ETAL   -N1(DB) ***",/,
     .         "CALIBRATION AMPLITUDE  -N1(DB) *** _")
      READ(1,*) IKN1
      RETURN
      END
```

```
      SUBROUTINE SORT
C     ***************
C
C     SORTIES DES BLOCS DE DONNEES
C     OUTPUT DATA BLOCKS
C
      COMMON IOUT(300)
C
C     TOP ECRITURE BLOC
C     WRITE A TIME SIGNAL BLOCK
C
      CALL ALLCO(2)
C
      IF(IOUT(1)) 10,20
C
C     SORTIE DU BLOC DE TETE
C     OUTPUT THE HEADER BLOCK
C
   20 DO 25 I=17,300
   25 IOUT(I)=0
      GO TO 100
   10 IF(IOUT(1)-177777B) 35,40,35
C
C     SORTIE DU BLOC FIN DE DEPOUILLEMENT
C     OUTPUT AN END OF PROCESSING BLOCK
C
   40 DO 45 I=18,300
   45 IOUT(I)=0
      GO TO 100
   35 IF(IOUT(1)-155555B) 50,60,50
C
C     SORTIE DU BLOC ECHO
C     OUTPUT AN ECHO BLOCK
C
   60 DO 65 I=299,300
   65 IOUT(I)=0
      GO TO 100
C
C     SORTIE DU BLOC ETALONNAGES
C     OUTPUT A CALIBRATION BLOCK
C
   50 DO 55 I=41,300
   55 IOUT(I)=0
  100 WRITE(10B)IOUT
C
C     INDICATIF 0 BLOC DE TETE
C               133333 BLOC ETALONNAGES
C               155555 BLOC ECHO
C               177777 BLOC FIN DE DEPOUILLEMENT
C
C     INDICATOR      0 HEADER BLOCK
C               133333 CALIBRATION BLOCK
C               155555 ECHO BLOCK
C               177777 END OF PROCESSING BLOCK
C
```



```
C     ATTENTE FIN DE SORTIE
C     WAIT FOR OUTPUT TO FINISH
C
      CALL WAIT
C
C    REMISE A ZERO DU BLOC
C    RESET THE BLOCK TO ZERO
C
      DO 63 I=1,300
   63 IOUT(I)=0
C
      CALL ALLCO(0)
C
      RETURN
      END
```

FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

** NO WARNINGS ** NO ERRORS ** PROGRAM = 00130 COMMON = 00300

```
      SUBROUTINE ALARM(IREP,L1,L2,L3,N0,N1,NPRIM)
C     ******************************************
C
C     TRAITEMENT DES ALARMES LIGNE DUPLEX 8BITS
C     TREATMENT OF THE ALARM CHANNEL (8 BIT DUPLEX REGISTER)
C     (OUTPUT THROUGH THE 40 BIT REGISTER)
C
      DIMENSION IVOIE(8),IVAL(8)
C
      COMMON IBUFE(613),IRJT(12)
      COMMON IBAFE(8),IRR1,IRR2,IEMAX(4),IKN1,IRR3
C
      CALL BYE(1024)
C
      IREP=IREP/16
      WRITE(6,1) IREP
    1 FORMAT(////,"NUMERO DE L'ALARME   ",I6,
     .        /,"NUMBER OF THE ALARM")
  500 GO TO (10,20,30,40,50,60,100),IREP
   10 WRITE(6,11)
   11 FORMAT(//,"CODE DE SORTIE =",
     .        /,"OUTPUT CODE = _")
      READ(1,*) IKODE
      ID=IKODE/10
      IU=IKODE-(ID*10)
      ID=ID*256
      IKODE=IOR(ID,IU)
C
      CALL BYE(IKODE)
C
      WRITE(6,12)
   12 FORMAT(//,"ENTREE ANALOGIQUE A ANALYSER =",
     .        /,"ENTER THE A/D CHANNEL TO BE ANALYSED = _")
      READ(1,*) IVOIE(1)
      IVOIE(2)=0
C
      CALL CONAD(IVOIE,IVAL,150)
C
      WRITE(6,13) IVAL(1)
   13 FORMAT(//,"ETALONNAGE =",I5,
     .        /,"CALIBRATION")
      IF(ISSW(1)) 100,500
   20 WRITE(6,21)
   21 FORMAT(//,"L1,L2,L3 *** _")
      READ(1,*) L1,L2,L3
      GO TO 100
   30 WRITE(6,31)
   31 FORMAT(//,"N0,N1,NPRIM *** _")
      READ(1,*) N0,N1,NPRIM
C
      CALL PARAM(N0)
C
      CALL PARAM(N1)
C
      CALL PARAM(NPRIM)
```



```
FTN4,L
      FUNCTION IDETC(J,N0,N1,L1,L2,L3,NUMER)
C     ****************************************
C
C     DETECTION D UN ECHO METEORIQUE
C     DETECTION OF A METEOR ECHO
C
C      J PARAMETRE DE RETOUR
C        IS THE PARAMETER RETURNED
C      IDCCO COMPTEUR DU TEST DETECTION
C            TESTS FOR A DETECTION
C      IDETC=1 TEST IDC FOIS CONSECUTIVES REJETE
C              CHECKS IDC FOR CONSECUTIVE REJECTIONS
C
      DIMENSION IA(100),ICONV(8)
C
      COMMON IOUT(300),IV(7),IBUFE(22),IA,ICONV,IPHI(5,35),
     1NECO,IRJT(12),IFINO(4),ITR(3),IALF0
C
      IDETC=1
      IDC=1000
      J=L1+L2+L3
      I1=L1+L2+1
      I2=J-1
      IDCCO=0
C
      CALL INIT(NUMER)
C
      CALL NUM
C
      IB=ICONV(4)
      DO 10 I=1,I2
   10 IA(I)=IB
C
   15 CALL NUM
C
      CALL BYE(2048)
C
      IA(J)=ICONV(3)
      IB=ICONV(4)
      N1MOY=0
      N3MOY=0
      DO 20 I=1,L1
   20 N1MOY=N1MOY+IA(I)
      DO 30 I=I1,J
   30 N3MOY=N3MOY+IA(I)
      N1MOY=N1MOY/L1
      N3MOY=N3MOY/L3
C
      CALL BYE(0)
C
      IF((N3MOY-N1MOY)-N0) 45,40
   40 IF(IA(J)-(IB+N1)) 45,50
   45 DO 60 I=2,J
   60 IA(I-1)=IA(I)
```

```
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         IDCCO=IDCCO+1
         IF(IDCCO-IDC) 15,90
   C
      50 CALL STATS(1)
   C
   C     COMMANDE TOP ALLCO
   C     START THE TIME SIGNAL ALLCO
   C
         CALL ALLCO(1)
   C
         IDETC=0
   C
         RETURN
   C
      90 CALL DINIT
   C
         RETURN
         END


FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

**  NO WARNINGS **  NO ERRORS **   PROGRAM = 00194      COMMON = 00633


 PAGE 0003  FTN.   4:07 PM  THU.,  5  FEB., 1981

         FUNCTION NUMT(J,N,IPTNO,NPRIM,K0)
   C     ********************************
   C
   C     NUMERISATION COMPLETE DE L ECHO
   C     COMPLETE DIGITIZATION OF AN ECHO
   C
   C     NUMT=1 REJET SUR FIN DE FRONT RAIDE
   C            REJECT FOR TOO RAPID DECAY
   C     NUMT=0 SINON
   C            IF NOT
   C
         DIMENSION IA(100),IPHI(5,35),ICONV(8)
   C
         COMMON IOUT(300),IV(7),IBUFE(22),IA,ICONV,IPHI
   C
         IPTT=4
         NBPS=7
         IPTRO=16
         IPTR=J+IPTRO
         IBOOL=0
         I=J
         IPRIM=0
         JFLAG=0
       5 IF(JFLAG) 35,20,35
      20 IREP=MAXIM(I)
         IF (IREP)25,25,15
      15 JFLAG=1
         K0=I-2
         IOUT(297)=ICONV(4)
         GO TO 35
      25 IF (I-IPTR)35,30
   C
      30 CALL DINIT
   C
         NUMT=1
   C
         CALL STATS(2)
   C
         RETURN
   C
      35 I=I+1
         IPRIM=IPRIM+1
   C
         CALL NUM
   C
         CALL BYE(2048)
   C
         IA(I)=ICONV(3)
         IB+ICONV(4)
         IF (IPRIM-35)80,80,90
      80 IPHI(1,IPRIM)=ICONV(1)
         IPHI(2,IPRIM)=ICONV(2)
         IPHI(3,IPRIM)=ICONV(6)
         IPHI(4,IPRIM)=ICONV(7)
         IPHI(5,IPRIM)=ICONV(5)
```

```
PAGE 0004  HUNT    4:07 PM  THU.,  5  FEB., 1981

C
      90 CALL BYE(0)
C
         IF(I-IPTN0) 40,75
   40    IF(IA(I)-(IB+NPRIM))50,50,60
    60   IBOOL=0
         GO TO 5
    50   IF( IBOOL-( IPTT-1)) 70,75
    70   IBOOL=IBOOL+1
         GO TO 5
C
    75   CALL DINIT
C
         N=I
         IF((N-K0)-NBPS) 76,77,77
C
    76   CALL STATS(10)
C
         HUNT=1
C
         RETURN
C
    77   HUNT=0
         RETURN
         END


FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

**  NO WARNINGS **  NO ERRORS **   PROGRAM = 00247      COMMON = 00612


PAGE 0005  FTN.    4:07 PM  THU.,  5  FEB., 1981

         FUNCTION ITRCO(N,K0,M,J,MP,ID,IPTN0,B,BRR)
C        *****************************************
C
C        TRAITEMENT DES ECHOS
C        TREATMENT OF THE ECHOS
C
C        ITRCO=1 REJET ECHO
C                REJECT THE ECHO
C        ITRCO=0 SINON
C                IF NOT
C
         DIMENSION B(100)
         DIMENSION IV(7),IFIMO(4),IO(5),I360(5),IAZ(4),IST(4),
        2IZE(2),IZD(2)
C
         COMMON IOUT(300),IV,IO,I360,IAZ,IST,IZE,IZD,IA(100),
        1ICONV(8),IPHI(5,35),NECO,IRJT(12),IFIMO
C
         CALL AMPLI(N,IPTN0,B,BRR)
C
         DO 100 K=1,4
C
         CALL TRANS(K0,M,K,J,N)
C
         CALL COREC(K,M)
C
         CALL CORFA(M,K)
C
         IBOOL=IPHAS(M,IFASE,K)
         IF(IBOOL) 120,120,200
     200 ITRCO=1
C
         RETURN
C
     120 IFIMO(K)=IFASE
     100 CONTINUE
         K=5
C
         CALL TRANS(K0,MP,K,J,N)
C
         CALL COREC(K,MP)
C
         IFID=IFIMO(1)
         IBET1=IZD(1)
         IFIDV=IFIMO(2)
         IBET2=IZD(2)
         IBOOL=IDIST(ID,IFID,IBET1,IFIDV,IBET2)
         IF (IBOOL)400,400,200
     400 ITRCO=0
         RETURN
         END


FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)
```

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PAGE 0001  FTN.   4:07 PM  THU.,  5  FEB., 1981

FTN4,L
      SUBROUTINE COREC(K,M)
C     *********************
C
C      CORRECTION TENSION-ANGLE
C      CONVERTS VOLTAGE TO ANGLE (PHASE)
C
      DIMENSION I0(5),I360(5)
C
      COMMON IOUT(300),IV(7),I0,I360,IBUFE(120),IPHI(5,35)
C
      A2=I360(K)-I0(K)
      DO 10 I=1,M
      IPHI(K,I)=IPHI(K,I)*64
C
C     CORRECTION VALEUR LUE CONVERTISSEUR-TENSION
C     CONVERTS THE VALUE FROM THE A/D CONVERTER TO VOLTAGE
C
      IPHI(K,I)=250.*FLOAT(IAND(IPHI(K,I),177700B))/32768.
C
C     CORRECTION TENSION-ANGLE
C     CONVERTS VOLTAGE TO ANGLE (PHASE)
C
      A1=IPHI(K,I)-I0(K)
      IPHI(K,I)=(A1*360.)/A2
   10 CONTINUE
      RETURN
      END


 FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

 **  NO WARNINGS **  NO ERRORS **   PROGRAM = 00122      COMMON = 00612
```

```
PAGE 0007  FTN.   4:07 PM  THU.,  5  FEB., 1981

      SUBROUTINE COMP(IBOOL,L,JEINF,JESUP,IEP)
C     ****************************************
C
C     COMPARAISON AUX FOURCHETTES
C     COMPARISON OF THE BOUNDS
C     IBOOL=0  TD  CODE ABSENT
C              TD  CODE ABSENT
C     IBOOL=1  TR  CODE TOUJOURS PRESENT
C              TR  CODE ALWAYS PRESENT
C     IBOOL=1  TD  CODE PRESENT
C              TD  CODE PRESENT
C     L=INDICE DANS IEP DE L ETALONNAGE
C       THE INDEX OF IEP FOR THE CALIBRATION
C
      DIMENSION JEINF(17),JESUP(17),IEP(19),IV(7),I0(5),I360(5)
C
      COMMON IOUT(300),IV,I0,I360
C
      IF(L-12) 10,10,20
   10 IF(L-8) 30,40
   20 M=L-12
      IF(IBOOL) 25,25,26
   26 IF (I360(M)-JEINF(L))25,27
   27 IF(JESUP(L)-I360(M))25,100
   25 I360(M)=IEP(L)
      IOUT(38)=IOUT(38)+1
C
      RETURN
C
   40 M=L-7
      IF(IBOOL) 45,45,46
   46 IF(I0(M)-JEINF(L))45,47
   47 IF(JESUP(L)-I0(M))45,100
   45 I0(M)=IEP(L)
      IOUT(38)=IOUT(38)+1
C
      RETURN
C
   30 IF(IBOOL) 35,35,36
   36 IF(IV(L)-JEINF(L)) 35,37
   37 IF(JESUP(L)-IV(L))35,100
   35 IV(L)=IEP(L)
      IOUT(37)=IOUT(37)+1
  100 RETURN
      END


 FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

 **  NO WARNINGS **  NO ERRORS **   PROGRAM = 00176      COMMON = 00317
```

```
PAGE 0002  FTN.   4:07 PM  THU.,  5  FEB., 1981

      SUBROUTINE AMPLI(N,IPTNO,B,BRR)
C     ********************************
C
C     TRANSFORMATION DES AMPLITUDES VOLTS-DBM
C     CONVERTS THE AMPLITUDES FROM VOLTS TO DBM
C
      DIMENSION IA(100),B(100),IV(7),ICONV(8),
     1IPHI(5,35),ANIVO(7)
C
      COMMON IOUT(300),IV,IBUFE(22),IA,ICONV,IPHI
      COMMON IBAFE(27),IKN1
C
C     CORRECTION VALEUR LUE CONVERTISSEUR - TENSION
C     CONVERTS THE VALUE FROM THE A/D CONVERTER TO VOLTAGE
C
      IBRR=IOUT(297)*64
      IBRR=250.*FLOAT(IAND(IBRR,177700B))/32768.
      DO 100 I=1,IPTNO
      IA(I)=IA(I)*64
  100 IA(I)=250.*FLOAT(IAND(IA(I),177700B))/32768.
      AKN1=IKN1+5
      DO 10 IP=1,6
      P=IP
   10 ANIVO(IP)=AKN1-5.*P
      ANIVO(7)=ANIVO(6)-10.
      DO 50 I=1,IPTNO
      IF(I-N)15,15,25
   25 B(I)=0
      GO TO 50
   15 DO 60 IP=1,6
      IF(IA(I)-IV(IP)) 30,20
   30 IF(IA(I)-IV(IP+1)) 60,60,20
   60 CONTINUE
      IP=6
   20 A1=IA(I)-IV(IP)
      A2=IV(IP)-IV(IP+1)
      A3=ANIVO(IP)-ANIVO(IP+1)
      B(I)=ANIVO(IP)+(A3*A1)/A2
   50 CONTINUE
C
C     TRANSFO. BRUIT A FFR
C     CONVERTS NOISE TO FFR
C
      DO 61 IP=1,6
      IF(IBRR-IV(IP)) 31,21
   31 IF(IBRR-IV(IP+1)) 61,61,21
   61 CONTINUE
      IP=6
   21 A1=IBRR-IV(IP)
      A2=IV(IP)-IV(IP+1)
      A3=ANIVO(IP)-ANIVO(IP+1)
      BRR=ANIVO(IP)+(A3*A1)/A2
      RETURN
      END
```

```
PAGE 0004  FTN.   4:07 PM  THU.,  5  FEB., 1981

            SUBROUTINE TRANS(K0,M,K,J,N)
      C     ****************************
      C
      C      TRANSLATION DES INDICES
      C      CHANGE THE INDICIES
      C
            COMMON IOUT(300),IBUFE(29),IA(100),ICONV(8),IPHI(5,35)
      C
            IQ=3
            IQP=5
            IF (K-5)2,1
          1 IQ=IQP
          2 K1=K0-J+IQ
            IF((K1+M-1)-(N-J)) 20,20,10
         10 M=N-K0-IQ+1
         20 DO 30 I=1,M
            K2=K1+I-1
            IPHI(K,I)=IPHI(K,K2)
         30 CONTINUE
            RETURN
            END

FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

**  NO WARNINGS **  NO ERRORS **   PROGRAM = 00091      COMMON = 00612

PAGE 0005  FTN.   4:07 PM  THU.,  5  FEB., 1981

            FUNCTION IDIST(ID,IFID,IBET1,IFIDV,IBET2)
      C     ****************************************
      C
      C     CALCUL DES DISTANCES
      C     CALCULATE THE DISTANCES
      C
      C     IDIST=1 : REJET , =0 SINON
      C               REJECT, =0 IF NOT
      C
            EPSIL=10.
            ALFA1=0.694
            ALFA2=0.087
            D1=ALFA1*FLOAT(IFID)+FLOAT(IBET1)/10.
            D2=ALFA2*FLOAT(IFIDV)+FLOAT(IBET2)/10.
            IF (D1-62.5)10,20
         10 D1=D1+250.
         20 IF (D2)30,40
         30 D2=D2+31.25
       40   GAMMA=IFIX(D1/31.25)
            IF (ABS(D1-D2-(GAMMA+1.)*31.25)-EPSIL)80,50
         50 IF(ABS(D1-D2-GAMMA*31.25)-EPSIL) 90,60
         60 IF (ABS(D1-D2-(GAMMA-1.)*31.25)-EPSIL)100,70
      C
         70 CALL STATS(3)
      C
            IDIST=1
      C
            RETURN
      C
       80   GAPRI=GAMMA+1.
            GO TO 110
       90   GAPRI=GAMMA
            GO TO 110
       100  GAPRI=GAMMA-1.
       110  D=D2+GAPRI*31.25
            IF (D-62.5)120,130
        120 D=D+250.
        130 IF(D-245.) 140,140,135
        135 IDIST=1
      C
            CALL STATS(4)
      C
            RETURN
      C
        140 ID=D+0.5
            IDIST=0
            RETURN
            END

FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

**  NO WARNINGS **  NO ERRORS **   PROGRAM = 00258      COMMON = 00000
```

PAGE 0006 FTN. 4:07 PM THU., 5 FEB., 1981

```
      FUNCTION IPHAS(M,IFASE,K)
C     *************************
C
C     CALCUL DES MOYENNES DES 4 PHASES
C     CALCULATE THE 4 PHASE AVERAGES
C
C     IPHAS=1 REJET
C             REJECT
C     IPHAS=0 SINON
C             IF NOT
C
      COMMON IOUT(300),IBUFE(29),IA(100),ICONV(8),IPHI(5,35)
      COMMON IBAFE(23),IEMAX(4)
C
      MR0=(M/3)+4
      ISOME=0
      DO 10 I=1,M
   10 ISOME=ISOME+IPHI(K,I)
      IPSIM=ISOME/M
      MR=M
      MAX=0
      DO 12 I=1,M
      IECAR=IABS(IPHI(K,I)-IPSIM)
      IF(IECAR-MAX)12,12,16
   16 MAX=IECAR
      J=I
   12 CONTINUE
      IF(MAX-IEMAX(K))35,35,17
   17 ISOME=ISOME-IPHI(K,J)
      MR=MR-1
      IPSIM=ISOME/MR
      DO 20 I=1,M
      IF(I-J)21,20,21
   21 IECAR=IPHI(K,I)-IPSIM
      IF(IECAR-IEMAX(K)) 15,15,25
   15 IF(IECAR+IEMAX(K)) 25,20
   25 ISOME=ISOME-IPHI(K,I)
      MR=MR-1
   20 CONTINUE
      IF(MR-MR0) 30,35
   30 IPHAS=1
C
      CALL STATS(K+4)
C
      RETURN
C
   35 IFASE=ISOME/MR
      IPHAS=0
      RETURN
      END
```

FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

PAGE 0001 FTN. 4:08 PM THU., 5 FEB., 1981

```
FTN4,L
      SUBROUTINE STATS(K)
C     ******************
C
C     STATISTIQUES SUR LES REJETS
C     STATISTICS FOR THE REJECTS
C
C     K=1 ECHO DETECTE
C         ECHO DETECTED
C     K=2 REJET FRONT RAIDE NON DETECTE
C         REJECT TOO STEEP NOT DETECTED
C     K=3  "    SUR TEST EPSILON DISTANCE
C         REJECT FOR THE EPSILON DISTANCE TEST
C     K=4  "    DISTANCE SUPERIEURE A 250 KM
C         REJECT FOR DISTANCE GREATER THAN 250 KM
C     K=5  "    PHASE DISTANCE
C         REJECT FOR THE PHASE OF THE DISTANCE
C     K=6  "      "        "    VERNIER
C         REJECT FOR THE PHASE OF THE DISTANCE VERNIER
C     K=7  "      "   AZIMUT
C         REJECT FOR THE PHASE OF THE AZIMUTH
C     K=8  "      "   SITE
C         REJECT FOR THE PHASE OF THE ELEVATION
C     K=9 ECHO RECONNU
C         ECHO ACCEPTED
C     K=10 NBRE PTS INSUFFISANT
C          INSUFFICIENT NUMBER OF POINTS
C
      COMMON IOUT(300),IBUFE(29),IA(100),ICONV(8),
     1IPHI(5,35),NECO,IRJT(12)
C
      IRJT(K)=IRJT(K)+1
      RETURN
      END
```

FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

** NO WARNINGS ** NO ERRORS ** PROGRAM = 00018 COMMON = 00625

```
PAGE 0002  FTN.   4:08 PM  THU.,  5  FEB., 1981

      FUNCTION MAXIM(I)
C     *****************
C
C     MAXIM=1 FIN DE FRONT RAIDE TROUVE
C             FOUND AN ECHO WHICH IS TOO SHORT
C
C     RECHERCHE DE LA FIN DU FRONT RAIDE
C     SEARCH FOR ECHOS WHICH ARE TOO SHORT
C
      COMMON IBUFE(329),IA(100),ITR2(203),IALF0
C
      IF((IA(I-1)-IA(I-3))-IALF0) 9,9,20
    9 IF((IA(I-1)-IA(I-2))-IALF0) 10,10,20
   10 IF((IA(I)-IA(I-1))-IALF0) 30,30,20
   30 MAXIM=1
C
      RETURN
C
   20 MAXIM=0
      RETURN
      END


 FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

 **  NO WARNINGS **  NO ERRORS **   PROGRAM = 00076      COMMON = 00633


PAGE 0003  FTN    4:08 PM  THU.,  5  FEB., 1981

      SUBROUTINE CORFA(M,K)
C     *********************
C
C     CORRECTION DES PHASES PROCHES DE 0 OU 360
C     CALCULATE THE PHASES NEAR 0 OR 360 DEGREES
C
      DIMENSION IT1(35),IT2(35)
C
      COMMON IOUT(300),IBUFE(29),IA(100),ICONV(8),IPHI(5,35)
C
      MP=0.6*FLOAT(M)
      IFIX1=20
      IFIX2=340
      MU1=0
      MU2=0
      MU3=0
      IPSI1=0
      IPSI2=0
      IPSI3=0
      DO 100 I=1,M
      IF(IPHI(K,I)-360) 20,20,30
   30 IPHI(K,I)=360
      GO TO 50
   20 IF(IPHI(K,I)) 40,50
   40 IPHI(K,I)=0
   50 IF(IPHI(K,I)-IFIX2) 70,60
   60 MU2=MU2+1
      IPSI2=IPSI2+IPHI(K,I)
      IT1(I)=IPHI(K,I)-360
      IT2(I)=IPHI(K,I)
      GO TO 100
   70 IF(IPHI(K,I)-IFIX1) 80,80,90
   80 MU1=MU1+1
      IPSI1=IPSI1+IPHI(K,I)
      IT1(I)=IPHI(K,I)
      IT2(I)=IPHI(K,I)+360
      GO TO 100
   90 MU3=MU3+1
      IPSI3=IPSI3+IPHI(K,I)
      IT1(I)=IPHI(K,I)
      IT2(I)=IPHI(K,I)
  100 CONTINUE
      IF((MU1+MU2)-MP) 110,120
C
  110 RETURN
C
  120 IF(MU1)110,110,130
  130 IF(MU2)110,110,140
  140 IF(MU3) 150,150,160
  160 IPSI1=IPSI1/MU1
      IPSI2=IPSI2/MU2
      IPSI3=IPSI3/MU3
      IF((IPSI3-IPSI1)-(IPSI2-IPSI3)) 500,750
  150 IF(MU1-MU2) 750,500
  500 DO 510 I=1,M
```

```
PAGE 0004  CORFA  4:08 PM  THU.,  5  FEB., 1981

              IPHI(K,I)=IT1(I)
      510 CONTINUE
C
              RETURN
C
      750     DO 760 I=1,M
              IPHI(K,I)=IT2(I)
      760 CONTINUE
          RETURN
          END

FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

**  NO WARNINGS **  NO ERRORS **   PROGRAM = 00428      COMMON = 00612
```

```
PAGE 0005  FTN.   4:08 PM  THU.,  5  FEB., 1981

          SUBROUTINE CONAD(IVOIE,IVAL,ME)
C         ******************************
C
C         MULTIPLEXAGE DES VOIES IVOIE(I) ET CONVERTION A/D
C         VALEUR MOYENNE LUE DANS IVAL(I)
C         MULTIPLEX THE CNANNELS IVOIE(I) AND THE A/D CONVERSION
C         AVERAGE VALUE IN IVAL(I)
C
          DIMENSION IVOIE(8),IVAL(8),ITAMP(200)
C
          I=1
      300 IF(IVOIE(I)) 100,100,200
      200 AMOY=0.
          ICANL=IVOIE(I)-1
C
          CALL L5610(7B,0,ICANL,ITAMP,ME)
C
          ISTAT=-1
C
        2 CALL L5610(7B,ISTAT)
C
          IF(ISTAT) 2,3
        3 DO 210 J=1,ME
      210 AMOY=AMOY+250.*FLOAT(IAND(ITAMP(J),177700B))/32768.
          IVAL(I)=AMOY/FLOAT(ME)
          I=I+1
          GO TO 300
      100 RETURN
          END

FTN4 COMPILER: HP92060-16092 REV. 2001 (791101)

**  NO WARNINGS **  NO ERRORS **   PROGRAM = 00306      COMMON = 00000
```

```
PAGE 0001 #01                          4:08 PM  THU.,  5  FEB., 1981


0001                 ASMB,L,T
CODE  R 000005
MEMO  R 000000
RETO  R 000001
NC    R 000002
NCP   R 000003
PARA  R 000004
NOUV  R 000014
LIRE  R 000032
**  NO ERRORS PASS#1 **RTE ASMB 92067-16011**
```

```
PAGE 0002 #01                          4:08 PM  THU.,  5  FEB., 1981


0001                 ASMB,L,T
0002  00000                 NAM RAZ
0003                        ENT RAZ
0004*
0005* REMISE A ZERO DU SWITCH REGISTER APRES CHAQUE TACHE
0006* RESET THE SWITCH REGISTER TO ZERO AFTER EACH TASK
0007*
0008  00000 000000  RETO  NOP
0009*
0010  00001 000000  RAZ   NOP
0011  00002 162001R       LDA RAZ,I
0012  00003 072000R       STA RETO
0013  00004 002400        CLA
0014  00005 102601        OTA 1B
0015  00006 126000R       JMP RETO,I
0016                      END
**  NO ERRORS *TOTAL **RTE ASMB 92067-16011**
```

```
PAGE 0001 #01                              4:08 PM  THU.,  5  FEB., 1981

                       ASMB,L,T
TBG10 R 000003
ITP1  C 000006
ICONV C 000655
ITP2  C 000665
FLAG  C 001165
CNT   C 001166
COUP  C 001167
SAVE1 R 000000
SAVE2 R 000001
CWAD  R 000002
**  NO ERRORS PASS#1  **RTE ASMB 92067-16011**
```

```
PAGE 0002 #01                              4:08 PM  THU.,  5  FEB., 1981

                       ASMB,L,T
      00000                   NAM CODE
*
*   LECTURE D UN CODE SUR LA LIGNE DUPLEX 17B
*   READ THE CODE FROM THE 8 BIT DUPLEX REGISTER (NOW 15B)
*
                              ENT CODE
      00000 000000  MEMO  NOP
      00001 000000  RETO  NOP
      00002 174060  NC    DEC -2000
      00003 000000  NCP   NOP
      00004 000000  PARA  NOP
*
*
      00005 000000  CODE  NOP
      00006 103100        CLF 0
      00007 162005R       LDA CODE,I
      00010 072001R       STA RETO              ADRESSE DE RETOUR
*                             RETURN ADDRESS
      00011 036005R       ISZ CODE
      00012 162005R       LDA CODE,I
      00013 072004R       STA PARA
      00014 016032R NOUV  JSB LIRE              LECTURE SUR 17B
*                             READ FROM 15B
      00015 072000R       STA MEMO
      00016 066002R       LDB NC
      00017 076003R       STB  NCP
      00020 016032R       JSB LIRE
*                             READ FROM 15B
      00021 052000R       CPA MEMO              CODE IDEM PRECEDENT
*                             CODE IDEM PRECEEDS
      00022 026024R       JMP *+2               OUI
*                             YES
      00023 026014R       JMP NOUV              NON
*                             NO
      00024 036003R       ISZ NCP
      00025 026020R       JMP NOUV+4
      00026 062000R       LDA MEMO
      00027 172004R       STA PARA,I
      00030 102100        STF 0
      00031 126001R       JMP RETO,I
*
      00032 000000  LIRE  NOP
      00033 103715        STC 15B,C
      00034 102515        LIA 15B
      00035 126032R       JMP LIRE,I
                          END
**  NO ERRORS *TOTAL **RTE ASMB 92067-16011**
```

PAGE 0002 #01 4:08 PM THU., 5 FEB., 1981

```
                    ASMB,L,T
      00000                NAM TBG10
                           ENT TBG10
                           COM ITP1(429),ICONV(8),ITP2(192),FLAG,CNT,COUP
      00000 000000  SAVE1  NOP
      00001 000000  SAVE2  NOP
      00002 060000  CWAD   OCT 60000
*
*  HORLOGE TEMPS REEL
*  REAL TIME CLOCK
*
      00003 000000  TBG10  NOP
      00004 103110         CLF 10B
      00005 037166C        ISZ CNT
      00006 126003R        JMP TBG10,I
      00007 103100         CLF 0
      00010 072000R        STA SAVE1
      00011 076001R        STB SAVE2
      00012 062002R        LDA CWAD
      00013 102611         OTA 11B
      00014 103711         STC 11B,C
      00015 103706         STC 6B,C
      00016 037165C        ISZ FLAG
      00017 063167C        LDA COUP
      00020 073166C        STA CNT
      00021 062000R        LDA SAVE1
      00022 066001R        LDB SAVE2
      00023 102306         SFS 6B
      00024 026023R        JMP *-1
      00025 106706         CLC 6B
      00026 102100         STF 0
      00027 126003R        JMP TBG10,I
                           END
**  NO ERRORS *TOTAL **RTE ASMB 92067-16011**
```

PAGE 0001 #01 4:09 PM THU., 5 FEB., 1981

```
                    ASMB,L,T
.IOC. X 000001
RCEOF R 000000
T1    R 000016
RET   R 000021
PARA  R 000022
**  NO ERRORS PASS#1 **RTE ASMB 92067-16011**
```

```
                   ASMB,L,T
      00000               NAM RCEOF
                          EXT .IOC.
                          ENT RCEOF
*
*     TEST FOR END OF FILE ON MAG-TAPE
*
      00000 000000  RCEOF NOP
      00001 162000R       LDA RCEOF,I
      00002 072021R       STA RET
      00003 036000R       ISZ RCEOF
      00004 162000R       LDA RCEOF,I
      00005 072022R       STA PARA
      00006 016001X       JSB .IOC.
      00007 040010        OCT 040010
      00010 001727        ALF,ALF
      00011 002020        SSA
      00012 026016R       JMP T1
      00013 002400        CLA
      00014 172022R       STA PARA,I
      00015 126021R       JMP RET,I
      00016 002404  T1    CLA,INA
      00017 172022R       STA PARA,I
      00020 126021R       JMP RET,I
      00021 000000  RET   NOP
      00022 000000  PARA  NOP
                          END
**  NO ERRORS *TOTAL **RTE ASMB 92067-16011**
```

PAGE 0002 #01   4:09 PM THU., 5 FEB., 1981

```
                   ASMB,L,T
      00000               NAM TEMPO
                          ENT TEMPO
      00000 000000  RETO  NOP
      00001 000000  .ICL  NOP
*
*TEMPORISATION DE ICYCL FOIS
*40 CYCLES DE BASE HP 2100 POUR ICYCL=10
*
*WAITING FOR ICYCLE TIMES
*40 CYCLES OF THE HP 2100 TIME BASE FOR ICYCLE = 10
*
      00002 000000  TEMPO NOP
      00003 162002R       LDA TEMPO,I
      00004 072000R       STA RETO
      00005 036002R       ISZ TEMPO
      00006 162002R       LDA TEMPO,I
      00007 160000        LDA 0,I
      00010 003004        CMA,INA
      00011 072001R       STA .ICL
      00012 036001R       ISZ .ICL
      00013 026012R       JMP *-1
      00014 126000R       JMP RETO,I
                          END
**  NO ERRORS *TOTAL **RTE ASMB 92067-16011**
```

```
PAGE 0002 #01                          4:09 PM  THU.,  5  FEB., 1981

                       ASMB,L,T
      00000                    NAM BYE
                               ENT BYE
      00000 000000  RETO   NOP
      00001 000000  CODI   NOP
      00002 000004  SAD    OCT 4
*
* LE CODE ENVOYE SUR LA LIGNE 40 BITS DEVIENT
* PERMANENT JUSQU'A L'APPEL BYE(0)
*
* SEND A CODE TO THE 40 BIT OUTPUT REGISTER
* IT LASTS UNTIL BYE(0) IS CALLED
*
* NOTE: SELECT CODE 21B HAS BEEN CHANGED TO 17B
*
      00003 000000  BYE    NOP
      00004 162003R        LDA BYE,I
      00005 072000R        STA RETO
      00006 036003R        ISZ BYE
      00007 162003R        LDA BYE,I
      00010 160000         LDA 0,I
      00011 072001R        STA CODI
      00012 106717         CLC 17B
      00013 062002R        LDA SAD
      00014 102617         OTA 17B
      00015 062001R        LDA CODI
      00016 102617         OTA 17B
      00017 103717         STC 17B,C
      00020 126000R        JMP RETO,I
                           END
**  NO ERRORS *TOTAL **RTE ASMB 92067-16011**
```

```
PAGE 0002 #01                          4:09 PM  THU.,  5  FEB., 1981

                       ASMB,L,T
      00000                    NAM WAIT
                               ENT WAIT
                               EXT .IOC.
*
*  ATTENTE FIN SORTIE SUR MAG-TAPE
*  WAIT UNTIL COMPLETION OF OUTPUT TO MAG-TAPE
*
      00000 000000  RETO   NOP
*
      00001 000000  WAIT   NOP
      00002 162001R        LDA WAIT,I
      00003 072000R        STA RETO
      00004 016001X        JSB .IOC.
      00005 040010         OCT 040010
      00006 000010         SLA
      00007 026004R        JMP *-3
      00010 126000R        JMP RETO,I
                           END
**  NO ERRORS *TOTAL **RTE ASMB 92067-16011**
```

```
PAGE 0002 #01                         4:09 PM  THU.,  5  FEB., 1981


0001                 ASMB,L,T
0002  00000                  NAM DINIT
0003                         ENT DINIT
0004*
0005* BLOCAGE DE L'HORLOGE TEMPS REEL
0006* STOP THE REAL TIME CLOCK
0007*
0008  00000 000000  RETO  NOP
0009*
0010  00001 000000  DINIT NOP
0011  00002 162001R       LDA DINIT,I
0012  00003 072000R       STA RETO
0013  00004 106710        CLC 10B
0014  00005 106711        CLC 11B
0015  00006 126000R       JMP RETO,I
0016                      END
**  NO ERRORS *TOTAL **RTE ASMB 92067-16011**
```

```
PAGE 0002 #01                         4:10 PM  THU.,  5  FEB., 1981


0001                 ASMB,L,T
0002  00000                  NAM DCBBI
0003                         ENT DCBBI
0004*
0005*  TRANSFORMATION DECIMAL CODE BINAIRE EN BINAIRE PUR
0006*  CHANGE BINARY DECIMAL CODE TO PURE BINARY CODE
0007*
0008  00000 000000  DCBBI NOP
0009  00001 006400        CLB
0010  00002 072024R       STA MEM
0011  00003 012025R       AND MSK
0012  00004 072026R       STA UNIT
0013  00005 062024R       LDA MEM
0014  00006 001727        ALF,ALF
0015  00007 001700        ALF
0016  00010 012025R       AND MSK
0017  00011 072027R       STA DIZ
0018  00012 062024R       LDA MEM
0019  00013 001727        ALF,ALF
0020  00014 012030R       AND =B3
0021  00015 100200        MPY =B12
      00016 000031R
0022  00017 042027R       ADA DIZ
0023  00020 100200        MPY =B12
      00021 000031R
0024  00022 042026R       ADA UNIT
0025  00023 126000R       JMP DCBBI,I
0026  00024 000000  MEM   NOP
0027  00025 000017  MSK   OCT 17
0028  00026 000000  UNIT  NOP
0029  00027 000000  DIZ   NOP
      00030 000003
      00031 000012
0030                      END
**  NO ERRORS *TOTAL **RTE ASMB 92067-16011**
```

```
                      ASMB,L,T
     00000                 NAM INIT
                           ENT INIT
                           EXT TBG10
                           COM ITP1(429),ICONV(8),ITP2(192),FLAG,CNT,COUP
     00000 000000  RETO    NOP
     00001 177776  .TD     DEC -2
     00002 177770  .TR     DEC -8
     00003 000001  FREQ    OCT 1
     00004 000655C DATA    DEF ICONV
     00005 177770  CW3     DEC -8
     00006 020011  CW1     OCT 020011
     00007 100000  CW2     OCT 100000
     00010 000001  .1      DEC 1
     00000                 ORB
     00000 000001X A1      DEF TBG10
     00001 114000B A2      JSB A1,I
     00011                 ORR
     00011 000000  PARA    NOP
*
        INITIALISATION DE LA TBG
        INITIALIZATION OF THE TIME BASE GENERATOR
*
     00012 000000  INIT    NOP
     00013 162012R         LDA INIT,I
     00014 072000R         STA RETO
     00015 036012R         ISZ INIT
     00016 162012R         LDA INIT,I
     00017 072011R         STA PARA
     00020 162011R         LDA PARA,I
     00021 052010R         CPA .1
     00022 026027R         JMP *+5
     00023 062002R         LDA .TR
     00024 073167C         STA COUP
     00025 073166C         STA CNT
     00026 026032R         JMP *+4
     00027 062001R         LDA .TD
     00030 073166C         STA CNT
     00031 073167C         STA COUP
     00032 002400          CLA
     00033 102611          OTA 11B
     00034 073165C         STA FLAG
     00035 062006R         LDA CW1
     00036 102606          OTA 6
     00037 106702          CLC 2
     00040 062007R         LDA CW2
     00041 032004R         IOR DATA
     00042 102602          OTA 2
     00043 102702          STC 2
     00044 062005R         LDA CW3
     00045 102602          OTA 2
     00046 102100          STF 0
     00047 062083R         LDA FREQ
     00050 102610          OTA 10B
     00051 060001B         LDA A2
```



```
                      ASMB,L,T
     00000                 NAM ALLCO
                           ENT ALLCO
*
* COMMANDE DU TOP DE MARQUAGE DE L'ALLCOSCRIPT
*                CARTE 8 BITS DUPLEX EN SORTIE
*
* CAUSES A TIMING MARK TO BE SENT TO THE ALLCOSCRIPT
*                USES THE 8 BIT DUPLEX OUTPUT REGISTER
*
* NOTE: SELECT CODE 17B HAS BEEN CHANGED TO 15B
*
     00000 000000  RETO    NOP
*
     00001 000000  ALLCO   NOP
     00002 103100          CLF 0
     00003 162001R         LDA ALLCO,I
     00004 072000R         STA RETO
     00005 036001R         ISZ ALLCO
     00006 162001R         LDA ALLCO,I
     00007 160000          LDA 0,I
     00010 102615          OTA 15B
     00011 103715          STC 15B,C
     00012 102100          STF 0
     00013 126000R         JMP RETO,I
                           END
**  NO ERRORS *TOTAL **RTE ASMB 92067-16011**
```

<< POWER FAIL ROUTINE FOR THE METEOR RADAR >>

```
0001                    ASMB,L,T
0003  00000                   NAM PFAIL
0004                          ENT PFAIL
0005*
0006  00000 000000  PFAIL NOP           POWER FAIL AUTO RESTART SUBROUTINE
0007*
0008  00001 102106        STF 6B        TERMINATES DCPC CHANNEL 1
0009  00002 102107        STF 7B        TERMINATES DCPC CHANNEL 2
0010  00003 102204        SFC 4B        SKIP IF INTERRUPT WAS CAUSED BY A POWER
0011*                                    FAILURE
0012  00004 026011R       JMP UP        POWER IS BEING RESTORED, RESET STATE OF
0013*                                    COMPUTER SYSTEM
0014  00005 003400  DOWN  CCA           SET SWITCH INDICATING THAT THE COMPUTER
0015  00006 072026R       STA SAVR       WAS RUNNING WHEN THE POWER FAILED
0016  00007 106704        CLC 4B        TURN ON RESTART LOGIC SO COMPUTER WILL
0017*                                    RESTART WHEN POWER IS RESTORED AFTER
0018*                                    MOMENTARY POWER FAILURE
0019*
0020  00010 102000        HLT
0021*                                   SHUTDOWN
0022*
0023  00011 062026R UP    LDA SAVR      WAS COMPUTER RUNNING
0024  00012 002003        SZA,RSS        WHEN POWER FAILED?
0025  00013 026023R       JMP HALT      NO
0026  00014 002400        CLA           YES, RESET COMPUTER RUN SWITCH TO
0027  00015 072026R       STA SAVR       INITIAL STATE
0028  00016 062024R       LDA FENCE     RESTORE THE MEMORY PROTECT
0029  00017 102605        OTA 5B         FENCE REGISTER CONTENTS
0030  00020 102704        STC 4B        RESET POWER FAIL LOGIC FOR NEXT POWER
0031*                                    FAILURE
0032  00021 102705        STC 5B        TURN ON MEMORY PROTECT
0033  00022 126025R       JMP SAVP,I    TRANSFER CONTROL TO PROGRAM IN EXECUTION
0034*                                    AT TIME OF POWER FAILURE
0035*
0036  00023 102000  HALT  HLT
0037*                                   RETURN COMPUTER TO HALT MODE
0038  00024 002000  FENCE OCT 2000      FENCE ADDRESS STORAGE (MUST BE UPDATED
0039*                                    EACH TIME FENCE IS CHANGED)
0040  00025 000002  SAVP  OCT 2         STORAGE FOR P (TRANSFER ADDRESS FOR
0041*                                    PROGRAM)
0042  00026 000000  SAVR  OCT 0         STORAGE FOR RUN SWITCH
0043                      END
**  NO ERRORS *TOTAL **RTE ASMB 92067-16011**
```

Appendix IV

The Data Reduction Computer Programs

Because of frequent power outages and brownouts at the Ramey receiving site, it is often necessary to edit the data tapes. As the first data tapes were produced, they were edited on the HP system in the School of Aerospace Engineering (by William Meyer, Research Engineer). More recently, a series of programs to produce edited copies of the data tapes have been developed for use on the School of Geophysical Sciences Data General Eclipse 120 Computer. These programs are summarized as follows:

FRENCH1

This program reads the original data tapes, and writes a print file (RAMEY TAPE) detailing the errors (missing bytes, words or records in each echo data block, for example) and their location on the tape.

FRENCH2

is then used to edit the tape, writing the edited version to disc, then copying from disc to produce edited tapes, one of which is forwarded to the French Groupe Radar Meteorique at CNET, the other being archived at Tech for further reduction and analysis to produce winds.

FRTAPE

copies from disc to tape, and can be used to add files to tape.

FRENCH3

is simply a listing routine, which reads the edited tape and writes a print file listing the tape contents.

FRENCH4

is the echo location and drift velocity routine provided by the French to perform a final editing of the data to weed out those echoes that do not meet the more stringent echo acceptance criteria which, in the interests of real time processing, could not be applied in the field. This program has undergone minor revisions for execution on the Data General Eclipse 120 Computer.

The program writes acceptable echoes to disc file GRODATA for subsequent wind analysis by the method of Groves (1959).

The program consists of

MAIN PROGRAM FRENCH4

and

SUBROUTINES

AMBIAZ
METEOR
HPDGRL
TRACER
TIME
CALCUL
ETALON

```
C     PROGRAM FRENCH1
C     OUTLINE OF WHAT IS ON DATA TAPES FROM RAMEY
C     DOES NOT EDIT
C     HEADER BLOCK IDENTIFIER IS OCTAL 000000
C     CALIBRATION BLOCK IDENTIFIER IS OCTAL 133333
C     ECHO BLOCK IDENTIFIER IS OCTAL 155555
C     END OF PROCESSING BLOCK IDENTIFIER IS OCTAL 177777
C
      DIMENSION IPKT(7),IPKTZ(7),IN(60)
      DATA IPKT/7*0/,IPKTZ/7*0/,NBAD/0/,IHEADER/000000K/,ICALIB/133333K/,
     *IECHO/155555K/,IEOP/177777K/,NECHO/0/,NECHOC/0/,NSUM/0/,KSUM/0/,L/0/


      OPEN 8,'@CONSOLE'
  112 CALL QGOPEN(7,'@MTA0',IPKT,IER)
      IF(IER.NE.1) PAUSE 'UNIT NOT ON LINE'
      IF(IER.NE.1) GO TO 112
      N=120
      N2=N/2
      IPKTZ(7)=N
      IPKTZ(1)=1
      NCOUNT=0
      OPEN 9,'RAMEYTAPE',ATT='P'
C
C     READ DATA TAPE
C
    1 CALL QRDB(7,IPKTZ,IN,ICNT,IER)
      NSUM=NSUM+1
      IF(NSUM.GT.5) NSUM=1
      IF(IER.EQ.118) WRITE(8,109)
  109 FORMAT(//12X'END OF TAPE')
      IF(IER.EQ.118) STOP 'LOGICAL END OF TAPE'
      IF(IER.EQ.27) GO TO 62
      IF(IER.EQ.1) GO TO 23
      WRITE(9,113) NCOUNT
      PAUSE
      WRITE(8,113) NCOUNT
  113 FORMAT(/6X,I5,' *** BAD RECORD ENCOUNTERED ***'/)
      WRITE(8,102) NCOUNT, ICNT,IER
      IPKTZ(6)=IPKTZ(6)+2
      NSUM=0
      KSUM=1
      NBAD=NBAD+1
      GO TO 1
   23 IPKTZ(6)=IPKTZ(6)+1
      L=0
      M=IN(1)
      IF(KSUM.EQ.1.AND.M.EQ.IHEADER) GO TO 1
      IF(NSUM.NE.1) L=1
      IF(M.NE.IECHO.OR.M.NE.ICALIB.OR.M.NE.IEOP) L=0
      NSUMR=NSUM-1
      IF(L.EQ.1) WRITE (9,111) NSUMR
  111 FORMAT(/12X,'PREVIOUS BLOCK HAS',I3,' RECORDS ************'/)
      IF(L.EQ.1) WRITE (8,111) NSUMR
      IF(L.EQ.1) NSUM=1
      L=0
      IF(NSUM.EQ.5.AND.KSUM.EQ.0) GO TO 59
      IF(IN(1).NE.IECHO) GO TO 24
      NECHO=NECHO+1
      NECHOC=NECHOC+1
      KSUM=0
      GO TO 1
   24 IF(NSUM.NE.1) GO TO 1
      IF(IN(1).EQ.IHEADER) WRITE(9,104) NCOUNT,(IN(II),II=1,5)
  104 FORMAT(6X,I6,2X,'HEADER BLOCK',O6,5I5)
      IF(IN(1).EQ.ICALIB) WRITE(9,110) NECHOC
  110 FORMAT(12X,'NUMBER OF ECHOES SINCE LAST CALIBRATION = ',I5)
      IF(IN(1).EQ.ICALIB) WRITE(9,105) NCOUNT,(IN(II),II=1,6)
  105 FORMAT(6X,I6,2X,'CALIBRATION BLOCK',O6,5I6)
      IF(IN(1).EQ.IEOP) WRITE(9,110) NECHOC
  106 FORMAT(/12X,'NUMBER OF ECHOES THIS FILE = ',I5/)
      IF(IN(1).EQ.ICALIB) NECHOC=0
      IF(IN(1).EQ.IEOP) WRITE(9,107) NCOUNT,(IN(II),II=1,6)
  107 FORMAT(6X,I6,2X,'END OF PROCESSING BLOCK',O6,5I5)
      IF(IN(1).EQ.IEOP) WRITE (9,106) NECHO
      IF(IN(1).EQ.IEOP) NECHOC=0
      IF(IN(1).EQ.IEOP) NECHO=0
      KSUM=0
      GO TO 1
   59 NSUM=0
      NCOUNT=NCOUNT+1
      WRITE(8,102) NCOUNT,ICNT,IER
  102 FORMAT('BLOCK NO.',I5,6X,'BYTE COUNT',I6,8X,'IER',I8)
      GO TO 1
   62 NSUM=0
      KSUM=0
      WRITE(8,108) NCOUNT
      PAUSE 'EOF ENCOUNTERED'
      WRITE(8,103) NBAD
  103 FORMAT(12X,'NUMBER OF BAD RECORDS =',I5)
      NBAD=0
      IPKTZ(5)=0
      IPKTZ(5)=IPKTZ(5)+1
      WRITE(9,108) NCOUNT
  108 FORMAT(/12X,I6,12X,'END OF FILE'/)
      NCOUNT=0
      GO TO 1
      END
```

```
C       PROGRAM FRENCH2
C       THIS PROGRAM PRODUCES COPIES OF THE RAMEY DATA TAPES
C       FOR TRANSMITTAL TO THE GROUPE RADAR METEORIQUE, CNET, FRANCE.
C       THIS VERSION CAN BE USED TO EDIT BLOCK BY BLOCK;
C       COPY 9 TRACK TAPE TO DISC;
C       THEN DISC TO NEW 9 TRACK TAPE.
C       WILL ALSO COPY DISC DIRECTLY TO 8 TRACK TAPE.
C
C       REQUIRES SUBROUTINES FRFILE AND FWFILE  FOR DISC FILE HANDLING
C
C       EDIT TASK CODES AS FOLLOWS:
C       SEARCH      SE         SEARCH FOR  BLOCK
C       COPY        CO         COPY NO. OF BLOCKS DESIGNATED BY 'COUNT'
C       DELETE      DE         DELETE NO. OF BLOCKS DESIGNATED BY 'COUNT'
C       INSERT      IN         INSERT A BLOCK
C       BACK9       B9         BACKSPACE FIELDSITE TAPE NO. OF RECORDS 'COUNT'
C       BACK7       B7         BACKSPACE COPY TAPE NO. OF RECORDS 'COUNT'
C
        DIMENSION IOUT(300),IOHOLD(300),I7(60),I9(80),IPKT(7),IPKTR(7)
       *,IHEAD(300)
        INTEGER COPY,DELETE,BACK7,BACK9,SEARCH
        DATA SEARCH,INSERT,COPY,DELETE,BACK7,BACK9,JOB,IHOLD/'SE','IN','CO','DE',
       *'B7','B9','  ','  '/
        DATA IPKT/7*0/,IPKTR/7*0/
        DATA ITETE,IETAL,IECHO,IEOP,IEND/000000K,133333K,155555K,177777K,144444K/
        NFILE=0
        CALL FRFILE(NFILE)
        OPEN 8,'@CONSOLE'
        JUMP=0
        LOOP=0
        NCOUNT=0
        NCON='Y '
        WRITE(8,102)
    102 FORMAT('START COPY AT FILE NO. ?')
        READ FREE (8) IPKTR(5)
    778 CALL QGOPEN(9,'@MTA0',IPKT,IER)
        IF(IER.NE.1) PAUSE '8 TRACK UNIT NOT ON LINE'
        IF(IER.NE.1) GO TO 778
        IPKTR(7)=120
        IPKTR(1)=1
        TYPE 'IF DATA ALREADY ON DISC, TYPE YES TO COPY'
        TYPE 'OTHERWISE, TYPE NO'
        READ (8,100) NSKIP
        IF(NSKIP.EQ.NCON) GO TO 89
        CLOSE 7
        NFILE=0
        CALL FWFILE(NFILE)
C
     11 WRITE(8,80)
     80 FORMAT('DO YOU WISH TO EDIT? YES OR NO')
        READ(8,100) NEDIT
C
      2 K=0
        DO 22 IBLOCK=1,5
        CALL QRDB(9,IPKTR,I9,ICNT,IER)
        IPKTR(6)=IPKTR(6)+1
        IF(IER.EQ.118) GO TO 4
        IF(IER.EQ.27) GO TO 3
        J=0
     21 J=J+1
        K=K+1
        IOUT(K)=I9(J)
        IF(J.LT.80) GO TO 21
     22 CONTINUE
        DO 9 I=1,300
        IOHOLD(I)=IOUT(I)
      9 CONTINUE
    220 WRITE(8,91)(IOUT(II),II=1,6)
     91 FORMAT(3X,O6,5I5)
C
C       EDIT, IF DESIRED
C
        IF(NEDIT.NE.NCON) GO TO 999
        IBLK1=0
        IF(IOUT(1).EQ.ITETE) IBLK1=1
        IF(IOUT(1).EQ.IETAL) IBLK1=1
        IF(IOUT(1).EQ.IECHO) IBLK1=1
        IF(IOUT(1).EQ.IEOP ) IBLK1=1
        IF(IBLK1.NE.1) GO TO 31
        IF(IOUT(1).NE.ITETE) GO TO 222
        DO 221 I=1,300
        IHEAD(I)=IOUT(I)
    221 CONTINUE
    222 IF(JOB.EQ.SEARCH.AND.IOUT(1).NE.ICOUNT) GO TO 888
        IF(JOB.EQ.SEARCH.AND.IOUT(2).NE.ND) GO TO 899
        IF(JUMP.NE.0) JUMP=JUMP-1
        IF(JUMP.NE.0) GO TO 2
        IF(LOOP.GT.0) GO TO 999
C
C       DEFINE EDIT TASK
C
      8 WRITE(8,88)
     88 FORMAT('ENTER TASK')
        READ (8,98,ERR=8) JOB
     98 FORMAT(A2)
        IF(JOB.EQ.SEARCH) GO TO 889
        IF(JOB.EQ.INSERT) GO TO 936
        WRITE(8,89)
     89 FORMAT('HOW MANY RECORDS?')
        READ FREE (8,ERR=8) ICOUNT
        IF(JOB.EQ.COPY) LOOP=ICOUNT
        IF(LOOP.GT.0) GO TO 899
        IF(JOB.EQ.DELETE) JUMP=ICOUNT
        IF(JUMP.GT.0) GO TO 2
        IF(JOB.NE.BACK9) GO TO 92
        IPKTR(6)=IPKTR(6)-ICOUNT
        CALL QRDB(9,IPKTR,I9,ICNT,IER)
        WRITE(8,91) (I9(II),II=1,6)
        GO TO 8
    889 WRITE (8,104)
    104 FORMAT('ENTER BLOCK TYPE (OCTAL), BLOCK NUMBER (I5)')
        READ(8,105,ERR=889) ICOUNT,ND
    105 FORMAT(O6,I5)
        ICHEK=0
        IF(ICOUNT.EQ.IETAL) ICHEK=1
        IF(ICOUNT.EQ.IECHO) ICHEK=1
        IF(ICOUNT.EQ.IEOP) ICHEK=1
        IF(ICHEK.NE.1) GO TO 889
        GO TO 988
     92 IF(JOB.NE.BACK7) GO TO 8
        DO 19 I=1,ICOUNT
        BACKSPACE 7
     19 CONTINUE
        READ BINARY (7) I7
        BACKSPACE 7
        NCOUNT=FLOAT(NCOUNT)-0.2*(FLOAT(ICOUNT))
        WRITE(8,91) (I7(II),II=1,6)
        GO TO 8
    930 WRITE(8,94)
     94 FORMAT('INPUT BLOCK TYPE (OCTAL), AND/OR BLOCK NO., JULIAN DAY, HOUR, MIN,
```

```
     *(415)'/
     *'ENTER 144444 AND 4 DUMMY TIMING VARIABLES TO INSERT AN END OF FILE')
      READ(8,95,ERR=930) (IOUT(IC),IC=1,5)
   95 FORMAT(O6,415)
      IF(IOUT(1(.NE.000000K) GO TO 219
      DO 218 I=6,300
      IOUT(I)=IHEAD(I)
  218 CONTINUE
  219 IF(IOUT(1).NE.IEND) GO TO 999
      CLOSE 7
      NFILE=NFILE+1
      CALL FWFILE(NFILE)
      GO TO 8
C
C     WRITE TO DISC
C
  999 K=0
      DO 20 I=1,5
      J=0
   19 K=K+1
      J=J+1
      I7(J(=IOUT(K)
      (F(J.LT.60) GO TO 19
      WRITE BINARY (7) I7
   20 CONTINUE
      NCOUNT=NCOUNT+1
      TYPE 'BLOCK NO.',NCOUNT,'       BYTE COUNT',ICNT
      (F(LOOP.GT.O( LOOP=LOOP-1
      IF(JOB.NE.INSERT) GO TO 2
      WRITE(8,97)
   97 FORMAT('COPY LAST RECORD READ FROM TAPE?')
      READ(8,100( IHOLD
      IF((HOLD.NE.NCON) GO TO 8
      DO 10 I=1,100
      IOUT(I)=IOHOLD(I(
   10 CONTINUE
      GO TO 899
    3 JOB='  '
      LOOP=0
      JUMP=0
      PAUSE 'EOF ENCOUNTERED'
      NSUM=0
      CLOSE 7
      WRITE (8,108)
  108 FORMAT('PROCESS NEXT FILE?')
      READ (8,100) NUF
      IF(NUF.EQ.NCON) GO TO 44
      IPKTR(6(=0
      IPKTR(5)=0
      TYPE 'MASTER TAPE IS REWINDING'
      CALL QRDB(9,IPKTR,(8,ICNT,IER)
      CALL QGCLOSE(9,'@MTA0',IPKT,IER)
      STOP 'NOTE: NOT ALL TAPE FILES COPIED'
C
   44 NFILE=NFILE+1
      CALL FWFILE (NFILE)
      IPKTR(6)=0
      IPKTR(5)=IPKTR(5)+1
      GO TO 11
C
    4 JOB='  '
      LOOP=0
      JUMP=0
      NSUM=0
      IPKTR(6)=0
      IPKTR(5)=0
      TYPE 'MASTER TAPE IS REWINDING'
      CALL QRDB(9,IPKTR,19,ICNT,IER)
   99 CLOSE 7
      CALL QGCLOSE(9,'@MTA0',IPKT,IER)
      TYPE 'UNLOAD 9 TRACK TAPE'
      TYPE 'LOAD NEW TAPE FOR COPY'
      PAUSE
C
C      READ DISC FILE 'FFILE'
C
      NFILE=0
      CALL FRFILE(NFILE)
  780 CALL QGOPEN(9,'@MTA0',IPKT,IER)
      (F(IER.NE.1) PAUSE '9 TRACK UNIT NOT ON LINE'
      IF(IER.NE.1) GO TO 780
      NCOUNT=0
      NSUM=0
C
    5 READ BINARY (7,END=6) I7
      NEND=0
C
C     WRITE 9 TRACK COPY
C
   93 CALL QWRB(9,IPKTR,I7,ICNT,IER)
      IPKTR(6)=IPKTR(6)+1
      NSUM=NSUM+1
      IF(NSUM.EQ.1) NCOUNT=NCOUNT+1
      IF(NSUM.EQ.1) WRITE(8,103) NCOUNT,(I7(II),II=1,8),ICNT,IER
  103 FORMAT(I6,2X,O8,6I5)
      IF(NSUM.LT.5) GO TO 5
      NSUM=0
      GO TO 5
C
    6 NEND=NEND+1
      IF(NEND.GT.1) GO TO 7
      PAUSE 'EOF ENCOUNTERED'
      NSUM=0
      CALL QGCLOSE(9,'@MTA0',IPKT,IER)
      CALL QGOPEN(9,'@MTA0',IPKT,IER)
      IPKTR(6)=0
      CLOSE 7
      NFILE=NFILE+1
      CALL FRFILE(NFILE)
      IPKTR(5)=IPKTR(5)+1
      GO TO 5
C
    7 CALL QGCLOSE(9,'@MTA0',IPKT,IER)
      NSUM=0
      CALL QGOPEN(9,'@MTA0',IPKT,IER)
      IPKTR(6)=0
      IPKTR(5)=0
      TYPE 'COPY IS REWINDING'
      CALL QRDB(9,IPKTR,I9,ICNT,IER)
      TYPE 'COPY COMPLETE'
      TYPE 'ANOTHER COPY?'
      READ (8,100) NGO
  100 FORMAT(A1)
      IF(NGO.EQ.NCON) GO TO 99
      TYPE 'UNLOAD COPY FROM 9 TRACK UNIT'
      CLOSE 7
      STOP 'ALL DONE'
C
```

```
 31 LOOP=0
    JUMP=0
    CALL QRDB(9,IPKTR,I9,ICNT,IER)
    IPKTR(6)=IPKTR(6)+1
    IF(IER.EQ.27) GO TO 3
    IF(IER.EQ.118) GO TO 4
    WRITE(6,91) I9(1),I9(2)
    WRITE(6,96)
 96 FORMAT('DO YOU WISH TO COPY THIS RECORD? YES OR NO')
    READ(6,100) NCOPY
    IF(NCOPY.NE.NCON) GO TO 31
    IPKTR(6)=IPKTR(6)-1
    GO TO 2
    END


      SUBROUTINE FRFILE(N)
C
C     THIS SUBROUTINE SPECIFIES UP TO 100 FILENAMES
C     'FFILE0' THROUGH 'FFILE99'
C     OPENS ALREADY CREATED FILE
C     I.E. IS APPROPRIATE WHEN AN ALREADY CREATED FILE IS TO BE READ
C
      INTEGER DISC(5)
      IF(N.GT.9) GO TO 10
      ENCODE(DISC,100) N
  100 FORMAT('FFILE',I1)
      BYTE(DISC,6)=0
      GO TO 20
   10 ENCODE(DISC,101) N
  101 FORMAT('FFILE',I2)
      BYTE(DISC,8)=0
   20 OPEN 7,DISC,LEN=120
      RETURN
      END


      SUBROUTINE FWFILE(N)
C
C     THIS SUBROUTINE SPECIFIES UP TO 100 FILENAMES
C     'FFILE0' THROUGH 'FFILE99'
C     APPROPRIATE TO THE OPENING OF A FILE TO BE WRITTEN,
C     SINCE IT DELETES ANY EXISTING FILE WITH THE SAME NAME.
C
      INTEGER DISC(5)
      IF(N.GT.8) GO TO 10
      ENCODE(DISC,100) N
  100 FORMAT('FFILE',I1)
      BYTE(DISC,8)=0
      GO TO 20
   10 ENCODE(DISC,101) N
  101 FORMAT('FFILE',I2)
      BYTE(DISC,9)=0
   20 DELETE DISC
      OPEN 7,DISC,LEN=120
      RETURN
      END
```

```
C         PROGRAM FRTAPE
C         PROGRAM TO COPY RAMEY TAPE DUPLICATE FROM DISC FILES
C         A MAXIMUM OF 100 FILES (FILE NOS. 0 TO 99) CAN BE COPIED
C         PROGRAM CAN ALSO BE USED TO ADD FILES TO TAPE
C         FILE NAMES (SCRUBS0, SCRUBS1, SCRUBS2.....) MUST MATCH
C         TAPE FILE NOS (@MTA0:0, @MTA0:1, @MTA0:2.....)
C
C         REQUIRES SUBROUTINE FRFILE TO OPEN FILES FOR READING
C
          OPEN 8,'@CONSOLE'
          DIMENSION 1N(60),IPKT(7),IPKTZ(7)
          DATA IPKT/7*0/,IPKTZ/7*0/,NO/0/,NEND/0/,NFILE/0/
          CALL FRFILE(NEND)
          CALL QGOPEN(9,'@MTA0',IPKT,IER)
       96 WRITE (8,97)
       97 FORMAT('HOW MANY FILES TO BE COPIED?')
          READ FREE (8,ERR=96) NF
       98 WRITE (8,99(
       99 FORMAT('START COPY AT FILE NO.')
          READ FREE (8,ERR=98) N
          N=N-1
          IPKTZ(1)=1
          IPKTZ(7)=120
        2 NEND=NEND+1
          NFILE=NFILE+1
          IF(NFILE.GT.NF) GO TO 3
          IF(NEND.GT.1) GO TO 4
          N=N+1
          IPKTZ(5)=N
          IPKTZ(6)=0
          CLOSE 7
          CALL FRFILE(N)
        1 READ (7,END=2) IN
          NEND=0
          CALL QWRB(9,IPKTZ,IN,ICNT,IER)
          NO=NO+1
          IF(NO.EQ.5) NO=0
          IF(NO.EQ.1) WRITE (8,100) (IN(I),I=1,6),IER
      100 FORMAT(O6,6I6)
          IF(IER.NE.1) GO TO 4
          IPKTZ(6)=IPKTZ(6)+1
          GO TO 1
        3 IPKTZ(5)=0
          IPKTZ(6)=0
          WRITE(8,102)
      102 FORMAT('9 TRACK UNIT REWINDING; WAIT FOR PAUSE')
          CALL QRDB(9,IPKTZ,IN,ICNT,IER)
          PAUSE
          CALL QGCLOSE(9,'@MTA0',IPKT,IER)
          CLOSE 7
          STOP 'ALL DONE'
        4 WRITE(8,101) IPKTZ(5),IPKTZ(6),ICNT,IER
      101 FORMAT('TAPE WRITE ERROR: FILE NO.',I6/18X,' RECORD NO.',I6/
         *18X,' BYTE COUNT',I6/18X,'ERROR CODE',I8//)
          IPKTZ(6)=0
          IPKTZ(5)=0
          WRITE(8,102)
          CALL QRDB(8,IPKTZ,IN,ICNT,IER)
          PAUSE
          CALL QGCLOSE(9,'@MTA0',IPKT,IER)
          CLOSE 7
          STOP 'ERROR TERMINATION'
          END
```

```
          SUBROUTINE FRFILE(N)
C
C         THIS SUBROUTINE SPECIFIES UP TO 100 FILENAMES
C         'FFILE0' THROUGH 'FFILE99'
C         OPENS ALREADY CREATED FILE
C         I.E. IS APPROPRIATE WHEN AN ALREADY CREATED FILE IS TO BE READ
C
          INTEGER DISC(5)
          IF(N.GT.9) GO TO 10
          ENCODE(DISC,100) N
      100 FORMAT('FFILE',I1)
          BYTE(DISC,8)=0
          GO TO 20
       10 ENCODE(DISC,101) N
      101 FORMAT('FFILE',I2)
          BYTE(DISC,9)=0
       20 OPEN 7,DISC,LEN=120
          RETURN
          END
```

```
C     PROGRAM FRENCH3
C     THIS PROGRAM READS RAMEY DATATAPES, WRITES TAPE STATISTICS TO
C     FILE 'RAMEYTAPE', AND TRANSFERS CALIBRATION DATA TO FILE
C     'CALS'. ('CALS' MUST THEN BE EDITED AND COPIED TO 'FRDATA'
C     FOR INPUT TO FRENCH4).
      OPEN 7,'CALS'
      OPEN 6,'@CONSOLE'
      OPEN 34,'RAMEYTAPE'
      COMMON/TAPE/ IPKT(7),IPKTW(7),IREC(80)
      COMMON/SLOC/ IOUT,IEOF,NBAD
      DATA ITETE,IETAL,IECHO,IEOP/000000K,133333K,166666K,177777K/
      DIMENSION IOUT(300)
      NECHO=0
      NECHOF=0
      IFILE=0
      WRITE(6,90)
   90 FORMAT('HOW MANY FILES DO YOU WANT READ?')
      READ(6,100) NFILES
  100 FORMAT(16I5)
    1 CALL METEOR
   69 FORMAT(O6,I6,4I4)
      FLD(IPKTW(1),2,2)=1
      IF(IEOF.EQ.1) IFILE=IFILE+1
      IF(IEOF.EQ.1) WRITE(34,102) NECHOF,IFILE
  102 FORMAT(//12X,'NUMBER OF ECHOES THIS FILE',I6,//12X,'END OF FILE',I6//)
      IF(IFILE.EQ.NFILES) GO TO 2
      IF(IEOF.EQ.1) NECHOF=0
      IF(IEOF.EQ.1) NECHO=0
      IF(IEOF.EQ.1) GO TO 1
      WRITE(6,69) (IOUT(II),II=1,6)
      IF(IOUT(1).EQ.ITETE) WRITE(34,103)(IOUT(L),L=2,6)
  103 FORMAT(6X,'HEADER BLOCK',5I6)
      IF(IOUT(1).EQ.IECHO) NECHOF=NECHOF+1
      IF(IOUT(1).EQ.IECHO) NECHO=NECHO+1
      IF(IOUT(1).EQ.IETAL) WRITE(34,101) NECHO,IOUT(2)
  101 FORMAT(12X,'NUMBER OF ECHOES SINCE LAST CALIBRATION',I6
     *,12X,'CALIBRATION NUMBER',I6)
      IF(IOUT(1).EQ.IETAL) WRITE(7,100)((IOUT(L),L=2,6),(IOUT(LK),LK=26,32))
      IF(IOUT(1).EQ.IEOP) WRITE(34,104) NECHO
      IF(IOUT(1).EQ.IEOP) NECHO=0
      IF(IOUT(1).EQ.IETAL) NECHO=0
  104 FORMAT(31X,I6,'  ******  END OF PROCESSING BLOCK  ******')
      GO TO 1
    2 WRITE(34,105) NBAD
  105 FORMAT(30X,'NUMBER OF BAD READS THIS TAPE',I6)
      STOP
      END
```

```
C       PROGRAM FRENCH4
C       THIS PROGRAM READS THE EDITED RAMEY BATA TAPE,
C       ANB PRODUCES A FILE IN THE GRODATA FORMAT
C       FOR INPUT TO GROVES
C
C        INPUT FILES ARE:
C        LIMITS  CONSTANT DATA, ERRORS, FILES ON TAPE TO BE PROCESSED
C        FRDATA  REALTIME CALIBRATIONS
C        ANTCAL  ANTENNA CALIBRATIONS (FROM AIRCRAFT)
C        SMTAO   EBITED DATA TAPE FROM FIELDSITE
C
C        OUTPUT FILES ARE:
C        GRODATA     USEABLE ECHOES FOR INPUT TO GROVES ANALYSIS
C        OUT1,OUT2  PROCESSING DIAGNOSTICS
C
        OPEN 6,'@CONSOLE'
        OPEN 4,'LIMITS'
        OPEN 5,'FRDATA'
        OPEN 8,'@LPT',ATT='P'
        OPEN 7,'ANTCAL'
        OPEN 12,'GRODATA'
        OPEN 34,'OUT1'
        OPEN 43,'OUT2'
        INTEGER DOUBLT,CARTES,TE(2),VALDA,VALBS,POS,AN,BI,HO,MI
        INTEGER CARAC(4),DMIN,DMAX,CLEF,DOUBLS
        REAL NPB
        REAL LAMBDA
        COMMON/BLOC/ IOUT(300),IFIN,NBAD
        COMMON/GEN/TE,DFIBET(2),BFIALF(2)
        COMMON/AMB/H(2),GLIM,PLIM
        COMMON/ETAL/DOUBLT,K,IFO,NBE,VALBA,VALDS,MOYAZ,MOYSI,DOUBLS
        COMMON/CALC/A,R,CARTES,VPY,NPB,DALPRI(16,45),DBAPRI(2,45),JNT,DV,NOHD
        COMMON /EF/NFD    ,NFF     ,IFIB1,IFIB2,IFIA1,IFIA2,DMIN,DMAX
        COMMON /ANT/ANU,PSIA,PSIB,PSIE,EPSI
        COMMON /TEST/ JOUMOI(12),JN,JF1,IANNEE
        COMMON /TETE/ ITET,IETAL,IECHO,IFINB
        COMMON /KONS/PI,CPI,LAMBDA,DELTAT,CONST,ILIM,B,D1,B,S1
        COMMON /CST/ HDM,GAM,GAM2,IAUTO
        COMMON/TAPE/ IPKT(7),IPKTW(7),IREC(60)
        DIMENSION (STA 16),ADRES1(101),L(ST(13)
        BATA CARAC/1HF,1HH,1HD,1HG/,JC/0/
        BATA IPKT/7*0/,IPKTW/7*0/
        DATA ITET,IETAL,IECHO,IFINB/000000K,133333K,155555K,177777K/
        EQUIVALENCE(ABRES1(1),IOUT(97))
        B=0
        JOUMOI(1)=0
        JOUMOI(2)=31
        JOUMOI(3)=59
        JOUMOI(4)=90
        JOUMOI(5)=120
        JOUMOI(6)=151
        JOUMOI(7)=181
        JOUMOI(8)=212
        JOUMOI(9)=243
        JOUMOI(10)=273
        JOUMOI(11)=304
        JOUMOI(12)=334
C       LECTURE DES BONNEES
        REAB(7,204) ISTA,IAUTO
  204   FORMAT(6A2,I1)
        READ(7,101) BMIN,BMAX,IXA1,IXA2,IXB1,IXB2
        READ(7,131) DV
        READ(7,131) A,R,ANU,PSIA,PSIB,PSIE,EPSI
        IPSIA=PSIA
        IPSIB=PSIB
        PSIE=PSIE*3.141592/180.
        REAB(7,102) ((DBAPRI)I,J),I=1,2),J=1,45)
        REAB(7,102) )(DALPRI)I,J),)=1,16(,J=1,45)
        READ(4,131) GLIM,PLIM,HDM,GAM,GAM2
        WRITE(6,131) HDM,GAM,GAM2
        IF()AUTO.EQ.1) WRITE(6,154)
  154   FORMAT("  PAS DE TR) MANUEL  ")
        READ(4,101( CARTES,CLEF,NOHD
        READ(4,203) DOUBLT,BOUBLS
        WRITE)6,1203) DOUBLT,DOUBLS
 1203   FORMAT((10X,"DOUBLET AZIMUT ",A6,10X,"DOUBLET SITE ",A6)
        DO 152 I=1,4
        IF(DOUBLT.NE.CARAC)I)) GO TO 1152
        BOUBLT=I
 1152   IF(DOUBLS.NE.CARAC(I)) GO TO 152
        BOUBLS=I
  152   CONTINUE
  153   READ(4,101) VALDA,VALDB
        READ(4,101) MOYAZ,MOYSI,IFO
        READ(4,101) NTOT
        READ(4,101) NPAS
        WRITE(6,1101) MOYAZ,MOYSI,IFO,NPAS
 1101   FORMAT(10X,"MOYAZ ",I5," MOYSI ",I5," IFO ",I5,"  NPAS ",I5(
        IFIB1=IPSID-IXB1-VALDS+MOYSI
        IF(IFIB1.GE,0( GO TO 40
        IFIB1=IFIB1+360
        GO TO 41
   40   IF(IFIB1.GE,360) IFIB1=IFIB1-360
   41   IFIB2=IFIB1+IXB2
        IFIA1=IPSIA-IXA1-VALDA+MOYAZ
        IF(IFIA1.GE.0) GO TO 42
        IFIA1=IFIA1+360
        GO TO 43
   42   IF(IF)A1.GE.360) IFIA1=IFIA1-360
   43   IFIA2=IFIA1+IXA2
C       BOUCLE M PASSAGES
        PI=3.1415926539
        CP(=180./PI
        LAMBDA=300./ANU
        IL(M=10800./LAMBDA
        DELTAT=0.005
        CONST=2.*ALOG10)LAMBBA)+5.5-ALOG10(32.)-2.*ALOG10(P))
        READ(4,101) IP
        IEOF=IP-1
        IPKTW(5)=IEOF
        BO 500 M=1,NPAS
        WRITE(6,490) IP
  490   FORMAT('PROCESSING FILE',I3)
  498   READ(5,101)POS,AN,BI,HO,MI
        READ(5,101) K
        TE(1)=0
        TE(2)=0
        JF1=0
        JF2=0
        JC =0
        JNT=0
        NER=0
C RECHERCHE ET LECTURE DU BLOC BE TETE
        IF(LAO.EQ.1) GO TO 22
    1   CALL METEOR
        IF(IFIN.EQ.2) GO TO 5000
        IF(IFIN.NE.1) GO TO 2
        IEOF=IEOF+1
```

```
      IF(IEOF.NE.NTOT) GO TO 1
      WR(TE(6,103) POS
  103 FORMAT(1H1,10X,"LE PASSAGE " ,I4,2X,"N EX(STE PAS")
      GOTO 5000
   22 LAO=0
    2 IF(IOUT(1).EQ.ITET) GO TO 998
      WRITE(34,997) IP
      WRITE(6,997) IP
  997 FORMAT(10X,'NO HEADER FOR FILE',I3)
      GO TO 5000
  999 IF(IP.EQ.POS) GO TO 3
      DO 499 I=1,K
      READ(5,101) L(ST
  499 CONTINUE
      LAO=1
      GO TO 498
    3 IF((IOUT(16).EQ.0).AND.(IOUT(2I.EQ.0)) GO TO 1000
      IF((AN.EQ.IOUT(15)I.AND.(DI.EQ.IOUT(2)).AND.(HO.EQ.IOUT(3)).AND.
     1(M(.EQ.IOUT(4))) GO TO 4
      WRITE(6,38) IOUT(16),(IOUT(L),L=2,4),AN,D(,HO,M(
      WR(TE(5,39) (OUT(16),I(OUT(LI,L=2,4),AN,DI,HO,MI
      GO TO 5000
 1000 IPKTW(6)=IPKTW)6)-1
      CALL QRDB(8,IPKTW,IREC,ICNT,IER)
      IOUT(16)=AN
      IOUT(2) = DI
      IOUT(3) = HO
      IOUT(4) = MI
    4 NJOUR =IOUT(2)
      IF((M.NE.1).OR.((((OUT(16(/4)*4).NE.)OUT(16))) GO TO 50
      DO 51 IND =3,12
   51 JOUMO((IND) = JOUMO((IND)+1
   50 CALL TIME(JOUR,NJOUR,MOIS)
      IANNEE=IOUT(15)
      WRITE(6,201))STA, IOUT(6),)OUT(7),(OUT(8),POS,(IOUT(L).L=8,10)
      WR(TE(6,202) JOUR,MOIS,IOUT(16),(OUT(3),IOUT(4)
      IDEP =IOUT(6)
      IBA = IOUT(7)
      IBN = IOUT(9)
      NPB = (OUT(10)
      WRITE(43,199) POS,IDEP,IBN,IBA
  199 FORMAT(59X,4I5)
      WRITE(34,199) POS,IDEP,(BN,(BA
C RECHERCHE ET LECTURE ÉTALONNAGES PUIS ECHOS
   44 CALL METEOR
      IF(IFIN.EQ.1) GO TO 15
      IF(IOUT(1I.NE.IETAL) GO TO 44
    6 CALL ETALON
      ZD=-10.
      ZDV = IOUT(36)
      NER=0
      NFD=0
      NFF=0
    5 D1=D
      B1 = B
      CALL METEOR
      IF(IFIN.NE.1) GO TO 7
      WR(TE(6,113)
  113 FORMAT(1HO,"PAS DE BLOC F(N DE DEPOU(LLEMENT")
      GO TO 15
    7 IF(IOUT(1).EQ.(ECHO) GO TO 10
      IF(IOUT(1).NE.IETAL) GO TO 8
      IF(IOUT(2)-NBE) 6,5,6
    8 IF(IOUT(1).EQ.IF(ND) GO TO 9
      IF((OUT(1).NE.(TET) GO TO 65
      IP=IP+1
   65 CONTINUE
      WRITE)6,104) ()OUT(L),L=1,10)
  104 FORMAT(1HO,"ERREUR SUR LE BLOC",10I6)
      IPKTW(6)=IPKTW(6)-1
      CALL QRDB(9,(FKTW,IREC,ICNT,IER)
      NER=NER+1
      IF(NER.NE.5) GO TO 6
      GO TO 500
    9 WRITE(9,105)
  105 FORMAT(1H1)
      NJOUR =IOUT(14)
      CALL TIME(JOUR,NJOUR,MOIS)
      WRITE(6,106) JOUR,MOIS,IANNEE,(IOUT(L),L=15,17(
  106 FORMAT(1HO,10X,"FIN DE DEPOUILLEMENT",2X,"DATE",2X,6)5,6X,"HEURE",5
     13I4)
      WRITE(6,107) (IOUT(L),L=2,11)
  107 FORMAT(/,/,20X,"NOMBRE D ECHOS DETECTES ",I3,/,20X,"REJETS FIN DE
     1 FRONT RAIDE ",I5,/,20X,"REJET SUR TEST DISTANCE",4(5,/,20X,
     2"REJETS SUR PHASES AZ(MUT,SITE ",2I5,/,20X,"NOMBRE D ECHOS RECONNU
     3S ",I5,/,20X,"REJET NOMBRE DE POINTS INSUFFISANT ",I5)
      GO TO 15
C CALCUL ET TESTS ECHOS
   10 IF(CLEF.NE.0) GO TO 11
      CALL ECHOF(JF1,JF2)
      IF(NFF.EQ.IOUT(2)I GO TO 6
   11 CALL CALCUL(313(
      NER=0
      GO TO 5
   13 JC=JC+1
      IF(NFD    .EQ.IOUT(2)) JF1=JF1-1
      GO TO 6
C   LISTE D)ECHOS
   15 CONTINUE
      WR)TE(6,117) JF1
      WRITE(6,110) JF2
      WRITE(6,111) JC
      WRITE(6,112) JNT
  117 FORMAT)/,60X,"ECHOS F DOUTEUX ",I5)
  110 FORMAT(/,50X,"ECHOS F ELIMINES ",I5)
  111 FORMAT(/,50X,"ECHOS EL(M(NES PAR CALCUL ",I6)
  112 FORMAT(/,50X,"ECHOS CONSERVES ",I5)
      IF(IFIN.NE.0) GO TO 6000
      (P =IP+1
      )EOF=IEOF+1
      CALL METEOR
  500 CONTINUE
 6000 IPKTW(5)=0
      IPKTW(5)=0
      CALL QRDB(8,IFKTW,IREC,(CNT,IER)
      UR=0.5
      WRITE(12) UR,(IOUT)I),I=1,40)
      ENDF(LE 34
  101 FORMAT(16I5)
  102 FORMAT(16F5.2)
  108 FORMAT(24X,10I5,//)
  131 FORMAT(7F7.2)
   38 FORMAT(1H1,5X,21HDATE LUE SUR LA BANDE,//,5X,4I5,///,5X,
     1 21HDATE LUE SUR LA CARTE,//,6X,4I5)
  201 FORMAT(1H1,//,39X,26HLOCALISATION  ET  VITESSE ,////,40X,
     15A2,"  CAMPAGNE"         ,I4,//,41X,16HBANDE ANALOGIQUE,I7,//,41X,
     215HBANDE NUMERIQUE,I5,//,45X,7HPASSAGE,I12,//,43X,10HSEUILS  NO,
     3I11,//,51X,2HNB,I11,//,51X,3HNPB,I10,//)
```

```
202 FORMAT(//,40X,12HMEASURES  DU ,2(I3,1H/),I6,//,40X,
   *16HHEURE DE DEBUT =,I3,1HH,I3,////)
203 FORMAT(2A1     )
    STOP
    END
```

```
      SUBROUTINE AMBIAZ(HD,G1,G2,ITOTO,JAMB,X1,X2,Y1,Y2)
      DIMENSION P(2)
      COMMON /AMB/H(2),GLIM,PLIM
       COMMON /BLOC/ IOUT(300),IFIN,NBAD
      COMMON /CST/ HDM,GAM,GAM2,IAUTO
      COMMON/TETE/ITET,IETAL,IECHO,IFIND
      EQUIVALENCE (BR,IOUT(197))
      D=IOUT(93)
      DO 1 I=1,2
      IF(H(I).GT.90.) GO TO 10
      P(I)=EXP(-((90.-H(I))**2)/98.)
C     IF(H(I).GT.94.) GO TO 10
C     P(I)=EXP(-((94.-H(I))**2)/98.)
      GO TO 30
   10 IF(H(I).GT.94.) GO TO 20
C   10 IF(H(I).GT.98.) GO TO 20
      P(I)=1.
      GO TO 30
   20 P(I)=EXP(-((H(I)-94.)**2)/60.9)
C  20 P(I)=EXP(-((H(I)-98.)**2)/60.8)
   30 IF(HD.EQ.0.)GO TO 1
      P(I)=EXP(-((HD-H(I)-HDM)**2)/50.)
    1 CONTINUE
      IF(P(2).LT.P(1))GO TO 40
      H(1)=H(2)
      P(1)=P(2)
      G1=G2
      X1=X2
      Y1=Y2
   40 IF(ABS(G1-GAM).GT.GLIM) GO TO 60
      IF(P(1).GE.PLIM)GO TO 50
      WRITE(6,3) (IOUT(L),L=4,9),IOUT(2),ITOTO,P(1),D,BR
    3 FORMAT(6X,3I3,I4,50X,"ECHO AMBIGU ",A2," IMPR P(1)= ",E12.5,2F7.2)
      JAMB=2
      RETURN
   50 CONTINUE
      WRITE(6,4) ITOTO,P(1)
    4 FORMAT( 6X,"ECHO AMBIGU ",A2," PROBABLE P(1)=",E12.5)
      RETURN
   60 WRITE(6,2) (IOUT(L),L=4,9),IOUT(2),ITOTO,D,BR
    2 FORMAT(6X,3I3,I4,50X,"ECHO AMBIGU ",A2," REJET GAMMA",12X,2F7.2)
      JAMB=2
      RETURN
      END
```

```
      SUBROUTINE METEOR
C     READS RAMEY DATA TAPE FOR PROCESSING BY FRENCH3
C
      DIMENSION IOUT(300),IREC(60),IPKT(7),IPKTW(7),ADRES1(101)
      COMMON/BLOC/ IOUT,IEOF,NBAD
      COMMON/TAPE/ IPKT,IPKTW,IREC
      DATA NBAD/0/,NCALL/0/
      EQUIVALENCE(ADRES1(1),IOUT(97))
C
C     SET UP FOR READING
C
      IEOF=0
C
      NCALL=NCALL+1
      IF(NCALL.GT.1) GO TO 2
      OPEN 11,'@CONSOLE'
      IPKTW(1)=1
      IPKTW(7)=120
    1 CALL QGOPEN(9,'@MTA0',IPKT,IER)
      IF(IER.NE.1) PAUSE '9 TRACK UNIT NOT ON LINE'
      IF(IER.NE.1) GO TO 1
    2 NBOMB=0
      K=0
C
C     READ 5 OF 90 WORD BLOCKS FROM 9 TRACK TAPE
C
      DO 3 I=1,5
      CALL QRDB(9,IPKTW,IREC,ICNT,IER)
      IPKTW(6)=IPKTW(6)+1
      IF(IER.EQ.27) GO TO 4
      IF(IER.EQ.115) GO TO 5
      IF(ICNT.NE.120) NBOMB=1
C
      J=0
   20 J=J+1
      K=K+1
      IOUT(K)=IREC(J)
      IF(J.LT.60) GO TO 20
    3 CONTINUE
      J=0
C
C     UNPACK HP REAL WORDS, AND REPACK IN DATA GENERAL FORMAT
C
      DO 35 I=1,101
      CALL HPDGRL(ADRES1(I))
   35 CONTINUE
C
      IF(NBOMB.EQ.0) RETURN
      NBAD=NBAD+1
      GO TO 2
C
C     END OF FILE ENCOUNTERED
C
    4 IEOF=1
      IPKTW(6)=6
      IPKTW(5)=IPKTW(5)+1
      RETURN
C
C     END OF TAPE ENCOUNTERED
C     REWIND AND EXIT
C
    5 IPKTW(5)=0
      IPKTW(6)=0
      CALL QRDB(9,IPKTW,IREC,ICNT,IER)
      END FILE 34
      TYPE 'NUMBER OF BAD READS',NBAD
      TYPE 'ALL DONE'
      STOP
C
      END


      SUBROUTINE HPDGRL (REAL)
C
C     CONVERTS HEWLETT/PACKARD REAL WORD TO DATA GENERAL REAL WORD
C     (HP REALS HAVE BINARY EXPONENT: DG REALS, HEXADECIMAL EXPONENT)
C
      DIMENSION IOUT(2)
      EQUIVALENCE(REAL1,IOUT(1))
      REAL1=REAL
      I1=0
      I2=0
C     SIGN OF MANTISSA
      FLD(I1,1,1)=FLD(IOUT(1),1,1)
C     REPOSITION MANTISSA
      FLD(I1,9,15)=FLD(IOUT(1),2,9)
      FLD(I2,1,7)=FLD(IOUT(1),10,15)
      FLD(I2,8,15)=FLD(IOUT(2),1,8)
      IEXP=0
C     SIGN OF EXPONENT
      FLD(IEXP,1,1)=FLD(IOUT(2),16,16)
C     RECOVER EXPONENT
      FLD(IEXP,10,16)=FLD(IOUT(2),9,15)
C     RAISE MANTISSA TO THE POWER ZERO
      FLD(I1,2,2)=1
C     EXPRESS MANTISSA TO THE POWER ZERO AS A DG WORD
      IOUT(1)=I1
      IOUT(2)=I2
C     RAISE THE MANTISSA TO THE CORRECT POWER
      REAL=REAL1*(2.0**IEXP)
      RETURN
      END
```

```
      SUBROUTINE ETALON
      INTEGER DOUBLS
      INTEGER DOUBLT, SITE,AZIM,TE(2),VALDA,VALDS
      COMMON /ETAL/DOUBLT,K,IFO,NBE,VALDA,VALDS,MOYAZ,MOYSI,DOUBLS
      COMMON/GEN/TE,DFIBET(2),DFIALF(2)
      COMMON/BLOC/IOUT(300),IFIN,NBAD
      COMMON /TEST/ JOUMOI(12),JN,JF1,IANNEE
      COMMON /TETE/ ITET,IETAL,IECHO,IFIND
      ICADRE(IV)=IV-(IV/180)*360
  110 FORMAT(10X,"DFIBETA=",F12.2,10X,"DFIALFA=",F12.2)
      WRITE(6,99)
   99 FORMAT(1H1)
      IF(IOUT(2).NE.1) GO TO 12
      READ(5,1001) (IOUT(L),L=2,6),(IOUT(KL),KL=25,32)
      LOG=1
      GO TO 5
   12 NJOUR =IOUT(3)
      CALL TIME(JOUR,NJOUR,MOIS)
      WRITE(6,100) IOUT(2),JOUR,MOIS,(IOUT(L),L=4,6)
  100 FORMAT(1H0,"ETALONNAGE NO ",I4,3X,"DATE ",2I6,5X,"HEURE ",3I6)
      WRITE(6,101) IOUT(DOUBLS+26),IOUT(DOUBLT+24)
  101 FORMAT(1H ,5X,"DOUBLET SITE",I6,9X,"DOUBLET AZIMUT",I6)
      WRITE(6,110) DFIBET(2),DFIALF(2)
      DFIBET(1)=DFIBET(2)
      DFIALF(1)=DFIALF(2)
      TE(1)=TE(2)
    1 IB=0
      IF(K.EQ.IOUT(2)) GO TO 3
      READ(5,1001) (IOUT(L),L=2,6),(IOUT(KL),KL=25,32)
      GO TO 5
    3 WRITE(6,102)
  102 FORMAT(1H0,"PAS DE 2EME ETALONNAGE")
      IF(LOG.NE.1) GO TO 10
      DFIBET(2)=DFIBET(1)
      DFIALF(2)=DFIALF(1)
      TE(2)=0.
      GO TO 10
 1001 FORMAT(I5(5)
    5 NJOUR =IOUT(3)
      CALL TIME(JOUR,NJOUR,MOIS)
      WRITE(6,100) IOUT(2),JOUR,MOIS,(IOUT(L),L=4,6)
      WRITE(6,101) IOUT(DOUBLS+26),IOUT(DOUBLT+24)
C     SITE
      SITE=IOUT(DOUBLS+25)
      IF(SITE.GT.2000) GOTO 14
      IV=MOD(IABS(SITE-MOYSI),360)
      IF(IABS(ICADRE(IV)).LE.IFO) GO TO 6
   14 IB=1
      SITE = MOYSI
      WRITE(6,104) MOYSI
  104 FORMAT(1H ,20X,"VALEUR SITE ABERRANTE",20X,"MOYENNE",I6)
    6 AZIM =IOUT(DOUBLT+24)
      IF(AZIM.GT.2000) GO TO 15
      IV=MOD(IABS(AZIM-MOYAZ),360)
      IF(IABS(ICADRE(IV)).LE.IFO)GO TO 7
   15 IB=1
      AZIM=MOYAZ
      WRITE(6,1D5) MOYAZ
  105 FORMAT(1H ,20X,"VALEUR AZIMUT ABERRANTE",20X,"MOYENNE",I6)
    7 IF(IB.NE.1) GO TO 8
      IF(LOG.NE.1) GO TO 1
      TE(1)=(((IOUT(3)*24+IOUT(4))*60+IOUT(5))*60 +IOUT(6)
      DFIBET(1)=ICADRE(VALDS-SITE)
      DFIALF(1) =ICADRE(VALDA-AZIM)
      WRITE(6,110) DFIBET(1),DFIALF(1)
      IF(K.EQ.IOUT(2)) GO TO 3
      LOG=0
      GO TO 1
    8 IF(LOG.NE.1) GO TO 9
      IL=1
      GOTO13
    9 IL=2
   13 TE(IL)= (((IOUT(3)*24+IOUT(4))*60+IOUT(5))*60+IOUT(6)
      DFIBET(IL) = ICADRE(VALDS-SITE)
      DFIALF(IL) = ICADRE(VALDA-AZIM)
      WRITE(6,110) DFIBET(IL),DFIALF(IL)
      IF(LOG.NE.1) GO TO 10
      LOG =0
      GO TO 1
   10 NBE=IOUT(2)
      WRITE(6,106)
  106 FORMAT(/////////,2X,2HNO,5X,5HHEURE,4X,1HN,5X,2HX ,3X,4HY-A ,2X,5H
     2GAMMA,5X,1HH,5X,3HV"Y,5X,4HDV"Y,4X,2HHD,4X,4HHD-H,3X,3HDHD,//)
      RETURN
      END
```

```
      SUBROUTINE TRACER
C
      DIMENSION LIGNE(110),REEL(101),IR(19),IB(8)
      INTEGER RDP,DUREE
      INTEGER BLANC,TRAIT, POINT,ETOILE
      COMMON/BLOC/IOUT(300),IFIN
      EQUIVALENCE (REEL(1),IOUT(97))
      DATA BLANC,TRAIT,POINT,ETOILE/1H ,1H-,1H.,1H*/
C
C     TRACER DE L)AMPL)TUDE
C
      N=1
   31 FORMAT(5X,I3,102A1,I4)
   32 FORMAT(110A1,I4)
      DO 5 I=10,80,10
      IJ=I/10
    5 IB(IJ)=I-150
      WRITE(6,11) (IB(I),I=1,8)
   11 FORMAT(///,45X," AMPLITUDE",//,7X,I4,7(6X,I4),//
     1,9X,1H*,14(5H....*))
      RDP=IOUT(94)
      NBR=REEL(101)+149.5
      IF((NBR.LE.0).OR.(NBR.GT.110)) NBR=1
      DO 190 I=1,110,1
  190 LIGNE(I)=BLANC
      DO 226 J=1,RDP
      IF(J.EQ.(IOUT(92)+2))LIGNE(110)=BLANC
      IF(J.EQ.IOUT(82)) LIGNE(110)=ETOILE
      IF(MOD(J,2).EQ.0) GO TO 220
      LIGNE(N)=BLANC
      LIGNE(NBR)=PO)NT
      DUREE=((J-1)*6)
      N=REEL(J)+149.5
      IF((N .LE.0).OR.(N.GT.110)) N=1
      LIGNE(N)=ETOILE
  195 LIGNE(10)=PO)NT
      IF(DUREE.EQ.0) GO TO 200
      IF(MOD(DUREE,60).EQ.0) GO TO 210
      GO TO 215
  200 LIGNE(10)=TRAIT
      WRITE(6,15) DUREE,(LIGNE(I),I=8,110,1),REEL(J) ,REEL(J+1)
      GO TO 220
  210 LIGNE(10)=TRAIT
      WRITE(6,16) DUREE,(LIGNE(I),I=6,110,1),REEL(J) ,REEL(J+1)
      GO TO 220
  215 WRITE(6,17) LIGNE,REEL(J),REEL(J+1)
   15 FORMAT(1X,6HTEMPS,I2,102A1,F7.2,F10.2)
   16 FORMAT(5X,I3,102A1,F7.2,F10.2)
   17 FORMAT(110A1,F7.2,F10.2)
  220 CONTINUE
      LIGNE(NBR)=BLANC
C
C     TRACER DOPPLER
C
      NPD=IOUT(95)
      DO 7 L=1,19,1
    7 IR(L)=(L-1)*20
      WRITE(6,40)(IR(L),L=1,19,1)
   40 FORMAT(2X,"DOPPLER",5X,I1,4X,I2,17(2X,I3),5X,/,9X,"*",20(5H....*))
      JPD=67+NPD-1
      DO 260J=67,JPD
      DO 250 LT=1,110,1
  250 LIGNE(LT)=BLANC
      LIGNE(10)=PO)NT
      ID=IOUT(J)+2
      ID=((ID/4)+15
      IF(((ID.GT.110).OR.(ID.LE.0)) GO TO 252
      LIGNE(ID)=ETOILE
  252 DUREE=((J-67)*6)
      IF(DUREE.EQ.0) GO TO 255
      IF(MOD(DUREE,60).EQ.0) GO TO 256
      GO TO 257
  255 LIGNE(10)=TRAIT
      WRITE(6,41)DUREE,(LIGNE(I),I=9,110),IOUT(J)
      GO TO 260
   41 FORMAT(1X,6HTEMPS,I2,102A1, )4,I8,I7)
  256 L)GNE(10)=TRAIT
      WRITE(6,31)DUREE,(LIGNE(I),I=8,110),IOUT(J)
      GO TO 260
  257 WRITE(6,32) LIGNE,IOUT(J)
  260 CONT)NUE
      WRITE(6,22      )
   22 FORMAT(       //,2X,2HNO,5X,5HHEURE,4X,1HH,5X,2HX  ,3X,4HY-A  ,2X,5H
     2GAMMA,5X,1HH,6X,3HV)Y,5X,4HDV)Y,4X,2HHD,4X,4HHD-1,8X,8HDHD,//)
      RETURN
      END
```

```
      SUBROUTINE TIME(JO,NJOUR,MOIS)
      COMMON /TEST/ JOUMOI(12),JND,JF1,IANNEE
      DO 10 IND=2,12
      IF( NJOUR   .LE.JOUMOI(IND)) GO TO 20
   10 CONTINUE
      IND=IND+1
   20 MOIS=IND-1
      JO= NJOUR -JOUMOI(MOIS)
      RETURN
      END
```

```
      SUBROUTINE CALCUL(S)
C     CALCULATES THE ECHO COORDINATES
C
      LOGICAL LHD
      REAL LAMBDA,MONIK,NPB
      DIMENSION T(100),TV(20),PHI(20),ADRES1(101)
      INTEGER TEM,CARTES,RMAX,RDP,TE(2)
      COMMON/GT/ LH,LM,MSEC,AZIMUTH,HITE,VEL,ELEV,JO,MO,MY,SOURCE(4)
      COMMON /GEN/TE,DFIBET(2),DFIALF(2)
      COMMON /AMB/ H1,H2,GLIM,PLIM
      COMMON/CALC/A,R,CARTES,VPY,NPB,DALPRI(16,46),DBAPRI(2,46),JNT,DV,NOHD
      COMMON /ANT/ANU,PSIA,PSIB,PSIE,EPSI
      COMMON/BLOC/IOUT(300),IFIN,NBAD
      COMMON /EF/NFD    ,NFF    ,IB1,IB2,IA1,IA2,DMIN,DMAX
      COMMON /TEST/ JOUMOI(12),JND,JF1,IANNEE
      COMMON /KONS/PI,CPI,LAMBDA,DELTAT,CONST,ILIM,D,D1,B,B1
      COMMON /CST/ HDM,GAM,GAM2,IAUTO
      COMMON/TETE/ ITET,IETAL,IECHO,IFIND
      DATA IAZI,ISIT/2HAZ,2HEL/
      DATA IBLANC,ISTAR,ISB/1H ,1H*,1HS/
      DATA IST/1HT/,UR/0.0/
      EQUIVALENCE(ADRES1(1),IOUT(97))
      INTE=IBLANC
      INTEE=IBLANC
      IONE=1
      HD=0.
      DHD=0.
      B=ADRES1(101)
      D=IOUT(93)
      NJOUR =IOUT(3)
      CALL TIME(JOUR,NJOUR,MOIS)
      TEM=(((IOUT(3)*24+IOUT(4))*60+IOUT(5))*60+IOUT(6)
      IF((TEM.LE.(TEM1+10.)).AND.((AMOD(ABS(D-D1),30.).LE.1.).OR.(AMOD
     1(ABS(D-D1),30.).GE.29.))) INTE=ISTAR
      IF(TEM.LE.(TEM1+3.)) INTE=IST
  801 TEM1=TEM
C
C     CALCUL DE HD
C
      IF(NOHD.NE.6) GO TO 275
      IF((INTE.NE.IST).AND.((INTE.NE.ISTAR))) GO TO 1444
      LEM=LEM+1
      IF(LEM.GE.2) GOTO 1445
      IF((NFA.EQ.(IOUT(2)-1)).OR.(INTE.EQ.ISTAR)) GO TO 1449
      RJ=1
      GO TO 1445
 1449 IF(((B-B1).LT.8.).AND.(ABS(D-D1).GT.1.)) GO TO 1144
      IF(NFA.NE.(IOUT(2)-1)) GO TO 1446
      BACKSPACE 34
      RJ = 1
      JNT = JNT - 1
 1445 WRITE(6,26) (IOUT(L),L=4,6),IOUT(2),D,B
   26 FORMAT(" RJT",I8,2I3,I4,92X,2F7.2)
      IF((LEM.NE.2).OR.(RJ.EQ.1)) GO TO 1446
      BACKSPACE 34
      JNT = JNT - 1
      RJ = 1
      IF(NFA.NE.(IOUT(2)-1)) GO TO 1446
      BACKSPACE 34
      JNT = JNT - 1
 1446 RETURN IONE
 1444 LEM=0
      RJ = 0
 1144 CONTINUE
      LI=0
      LHD=.TRUE.
      RMAX=IOUT(92)
      RDP =IOUT(94)
      GO TO 5501
 5502 RMAX=RMAX+1
 5501 CONTINUE
      IF(RMAX.GT.30) GO TO 273
      IF((ADRES1(RMAX+2).GT.ADRES1(RMAX+1)).OR.(ADRES1(RMAX+3).GT.
     1ADRES1(RMAX+1))) GO TO 5502
      NT=0
      JBEL=RMAX+1
      IF((ADRES1(JBEL)-ADRES1(101)).LT.18.) INTEE=ISB
  592 FORMAT(1H+,125X,2A1,I4)
      DO 305 J=JBEL,RDP
      IF(ADRES1(J).LT.(NPB+ADRES1(101))) GO TO 306
  305 NT=NT+1
  306 JGER=RMAX+NT
      IF((ADRES1(JBEL)-ADRES1(JGER)).LT.(.1*FLOAT(NT))) LI=1
      IF((ADRES1(JBEL)-ADRES1(JGER)).LT.(.05*NT)) GO TO 2272
      TMOYEN=0.
      T(RMAX)=0.
      SIMAPT=0.
      SIMAP2=0.
      SIMAT2=0.
      PMOYEN=ADRES1(RMAX)
      DO 310 J=JBEL,JGER
      PMOYEN=PMOYEN+ADRES1(J)
      T(J)=FLOAT(J-RMAX)*DELTAT
  310 TMOYEN=TMOYEN+T(J)
      NT=NT+1
      PMOYEN=PMOYEN/FLOAT(NT)
      TMOYEN=TMOYEN/FLOAT(NT)
      JGER=RMAX+NT-1
      DO 320 J=RMAX,JGER
      SIMAPT=(ADRES1(J)-PMOYEN)*(T(J)-TMOYEN)+SIMAPT
      SIMAT2=SIMAT2+(T(J)-TMOYEN)**2
  320 SIMAP2=SIMAP2+ADRES1(J)**2
      MONIK=-4.343*SIMAT2/SIMAPT
      IF(MONIK.LT.0.)GO TO 273
      HD=(CONST-ALOG10(MONIK))/0.087
      SIMA2=SIMAP2-FLOAT(NT)*PMOYEN**2-SIMAPT**2/SIMAT2
      IF(SIMA2.LT.0.) GO TO 271
      FACTOR=(SIMA2/(FLOAT(NT-2)*SIMAT2))
      SIMA2=SQRT(FACTOR)
      SPI=(SIMAPT/SIMAT2+SIMA2)/(SIMAPT/SIMAT2-SIMA2)
      IF(SPI.LT.0.) GO TO 271
      DHD=ABS(ALOG10(SPI))/0.087
      IF(DHD.LE.2.) GO TO 274
      IF(DHD.LE.3.) GO TO 271
 2272 CONTINUE
      WRITE(6,272) (IOUT(L),L=4,8),IOUT(2),HD,DHD,D,ADRES1(101)
  272 FORMAT(6X,3I3,I4,28X,"REJET HD",8X,F7.1,8X,F6.1,27X,2F7.2)
      WRITE(6,502) INTE,INTEE
      RETURN IONE
  271 LHB=.FALSE.
      GO TO 275
 2774 WRITE(6,2773) (IOUT(L),L=4,6),IOUT(2),D,ADRES1(101)
 2773 FORMAT(6X,3I3,I4,50X,"DOUTEUX F-HD",30X,2F7.2)
      WRITE(6,502) INTE,INTEE
      RETURN IONE
  275 HD=0
      LHD=.FALSE.
      IF(IAUTO.EQ.1) GO TO 2272
```

```
      GO TO 275
C
C     CALCUL DES COORDONNEES DE L'ECHO
C
  274 LHD=.NOT.((LI.EQ.1).AND.(DHD.GT.0.8))
  275 CONTINUE
      IF((NFD   .EQ.IOUT(2)).AND.(.NOT.LHD)) GO TO 2774
      TEMI=FLOAT(TEM-TE(1))/FLOAT(TE(2)-TE(1))
      DFIBA=DFIBET(1)+((DFIBET(2)-DFIBET(1))*TEMI)
      DFIAL=DFIALF(1)+((DFIALF(2)-DFIALF(2))*TEMI)
      PHIALF=IOUT(89)
      PHIBET=IOUT(90)
      JTOTO=0
      ITOTO=1
      KTOTO=1
      PHIALF=PHIALF+DFIAL
      PHIBET=PHIBET+DFIBA
      IF(PHIALF.LE.(PSIA-GAM2-235.)) PHIALF=PHIALF+360.
      IF(PHIALF.GE.(PSIA-GAM2+235.)) PHIALF=PHIALF-360.
      IF(ABS(PHIALF-PSIA+GAM2).LE.125.) GO TO 30
      IF(PHIALF.LT.(PSIA-GAM2-125.)) FIALF2=PHIALF+360.
      IF(PHIALF.GT.(PSIA-GAM2+125.)) FIALF2=PHIALF-360.
      ITOTO=2
      SIA=(PSIA-FIALF2)/7200.*LAMBDA
      ALFAP2= ATAN(SIA/SQRT(1.-SIA*SIA))
   30 SIA=(PSIA-PHIALF)/7200.*LAMBDA
      ALFAP1= ATAN(SIA/SQRT(1.-SIA*SIA))
C     H1=HD
C     BETAP2=ATAN(H1/SQRT(D*D-H1*H1))
C     X1=D*SIA
C     Y1=SQRT(D*D-H1*H1-X1*X1)
C     GO TO 95
      ALFA=ALFAP1
      IF(PHIBET.GE.(PSIB-(LIM+360)) PHIBET=PHIBET-360.
      IF(PHIBET.GE.(PSIB-ILIM)) GO TO 68
   50 PHIBET=PHIBET+360.
   68 IF(PHIBET.LE.PSIB) GO TO 69
      WRITE(5,116) (IOUT(L),L=4,8),IOUT(2)
      WRITE(6,502) INTE,INTEE
      RETURN IONE
   69 COB=(PSIB-PHIBET)/10800.*LAMBDA
      BETAP2=ATAN(SQRT(1.-COB*COB)/COB)
      IALFA=ALFA*CPI/2.+9.
      IF(IALFA.LT.1) IALFA=1
      IF(IALFA.GT.15) IALFA=16
      IBETA=BETAP2*CPI-23.5
      IF(IBETA.GT.46) IBETA=46
      IF(IBETA.LT.1) IBETA=1
      ALFSEC=ALFA+DALPRI(IALFA,IBETA)   /CP)
      BETA =BETAP2+(DBAPRI(1,IBETA)/CPI+ALFA*DBAPRI(2,IBETA))
      COB=COS(BETA)
      BDEUX =COS(ALFSEC)**2-COB*COB
      IF(BDEUX.LT.0.) BDEUX=0.
      BDEUX=ATAN(SQRT(BDEUX)/COB)
      IF(EPSI.EQ.0.) GO TO 71
      BDEUX=BDEUX-EPSI
      COB=COS(BDEUX)*COS(ALFSEC)
   71 AZIM=ATAN(SIN(ALFSEC)/COS(ALFSEC)/COS(BDEUX))
      COEM=COS(AZIM+PSIE)/COS(AZIM)
      Y2=A*COB*COB*COEM+(D+A)*COB
      X2=Y2*SIN(ALFSEC)/COB
      Z2=Y2*SIN(BDEUX)/COS(BDEUX)
      IF(Z2.LT.75.) GO TO 50
      H2=Z2+Y2*Y2/(2.*R)
      IF(JTOTO.NE.1) GO TO 76
      JTOTO=0
      GO TO 80
   76 X1=X2
      Y1=Y2
      H1=H2
      IF(ITOTO.EQ.1) GO TO 80
      JTOTO=1
      ALFA=ALFAP2
      GO TO 69
   80 IF(Z2.GT.75.) GO TO 85
      X3=X1
      X4=X2
      Y3=Y1
      Y4=Y2
      H3=H1
      H4=H2
      ALFA=ALFAP1
      KTOTO=2
      GO TO 50
C                     CALCUL DE LA VITESSE
   85 IF(KTOTO.NE.2) GO TO 58
       IF(ITOTO.NE.2) GO TO 56
       WRITE(5,374) (IOUT(L),L=4,8),IOUT(2) ,D,ADRES1(101)
       WRITE(9,502) INTE,INTEE
       RETURN IONE
   59 NPDOP =IOUT(86)
      IF(NPDOP.GT.4) GO TO 585
      WRITE(6,115) (IOUT(L),L=4,8),IOUT(2)
      WRITE(6,502) INTE,INTEE
       RETURN IONE
  585 CONTINUE
      DO 87 I=1,NPDOP
   87 PHI(I)=IOUT(I+89)
       NP1=0
      INI=1
       NP=0
   88 TV(1)=0.
       TTOT=0
      PHITOT=0.
       PHITO2=0.
       IF(PHI(1).EQ.8888.) GO TO 92
   81 PHITOT=PHI(1)
      PHITO2=PHI(1)**2
   92 DO 100 I=2,NPDOP
      IF(PHI(I).EQ.8888.) GO TO 100
      IF(NP.NE.0) GO TO 97
      PHINI=PHI(INI)
      PHIND=PHI(I)
   95 IF((PHIND-PHINI).LE.180.) GO TO 96
       PHIND=PHIND-360.
       GO TO 95
   96 IF((PHIND-PHINI).GE.(-180.)) GO TO 997
      PHIND=PHIND+360.
      GO TO 95
  997 IF(ABS(PHIND-PHINI).LT.120.) GO TO 998
      IF((PHI(I).LT.120.).OR.(PHI(I).GT.240.)) GO TO 999
      PHI(I)=9999.
      NP1=NP1+1
      GO TO 100
  998 PHI(I)=PHIND
      INI=I
   87 PHITOT=PHITOT+PHI(I)
      PHITO2=PHITO2+PHI(I)**2
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 100 CONTINUE
     DO 90 I=2,NPDOP
     IF(PHI(I).NE.9999.) GO TO 69
     TV(I)=0.
      GO TO 90
  69 TV(I)=0.9*FLOAT(I-1)
  90 TTOT=TTOT+TV(I)
     TBARRE=TTOT/FLOAT(NPDOP-NP-NP1)
     PHIBAR=PHITOT/FLOAT(NPDOP-NP-NP1)
     TOTNUM=0.
     TOTDEN=0.
     IF(PHI(1).EQ.9999.) GO TO 105
 101 TOTNUM=-PHI(I)*TBARRE
     TOTDEN=TBARRE**2
 105 DO 110 I=2,NPDOP
     IF(PHI(I).EQ.9999.) GO TO 110
     TOTNUM=TOTNUM+PHI(I)*(TV(I)-TBARRE)
     TOTDEN=TOTDEN+(TV(I)-TBARRE)**2
 110 CONTINUE
     DFIST=TOTNUM/TOTDEN
     IF((NPDOP-NP-NP1).GT.3) GO TO 112
     WRITE(6,115) (IOUT(L),L=4,6),IOUT(2)
     WRITE(6,502) INTE,INTEE
     RETURN IONE
 112 GERARD=PHITO2-FLOAT(NPDOP-NP-NP1)*PHIBAR**2-DFIST**2*TOTDEN
     IF(GERARD.GE.0.) GO TO 113
     SIGMA=0.
     GO TO 120
 113 SIGMA=SQRT(GERARD/(FLOAT(NPDOP-NP-NP1-2)*TOTDEN))
 120 CONTINUE
     IF(NP.NE.0) GO TO 1400
     IF((NPDOP-NP1).EQ.2) GO TO 1400
     DO 135 I=1,NPDOP
     IF(PHI(I).EQ.9999.) GO TO 135
     DISTAN   =(PHI(I)-PHIBAR-(DFIST*(TV(I)-TBARRE)))**2
     DELTA2=(GERARD/FLOAT(NPDOP-NPI-2))*3.
     IF(DISTAN  .LE.DELTA2) GO TO 135
     PHI(I)=9999.
     NP=NP+1
 135 CONTINUE
     IF(NP.NE.0) GO TO 88
1400 JAMB=1
     MTRA=IAZI
     GAMMA1=100.*(X1+A*SIN(PSIE))/(Y1-A*COS(PSIE))
     IF(ITOTO.NE.1) GOTO 141
     IF(KTOTO.EQ.1) GO TO 140
     X2=X3
     Y2=Y3
     H2=H3
     MTRA=ISIT
 141 GAMMA2=100.*(X2+A*SIN(PSIE))/(Y2-A*COS(PSIE))
     CALL AMB(AZIHD,GAMMA1,GAMMA2,MTRA,JAMB,X1,X2,Y1,Y2)
     IF(JAMB.NE.2) GO TO 140
     WRITE(6,502) INTE,INTEE
     RETURN IONE
 140 COEF=41.38887/ANU*(D+A)/
    1SQRT((Y1-A*COS(PSIE))**2+(X1+A*SIN(PSIE))**2)
     COEF=COEF/COS(ATAN(SIN(ALFA)/COS(BETAP2)))
     IF((H1.GE.75.).AND.(H1.LE.110.)) GO TO 400
     WRITE(6,401) (IOUT(L),L=4,8),IOUT(2),D,ADRES1(101)
 401 FORMAT(9X,3I3,I4,60X,"REJET ALTITUDE",26X,2F7.2)
     WRITE(6,502) INTE,INTEE
     RETURN IONE
 400 IF(ABS(GAMMA1-GAM).LT.GLIM) GO TO 403
     WRITE(6,402) (IOUT(L),L =4,6),IOUT(2) ,D,ADRES1(101)
 402 FORMAT(6X,3I3,I4,80X,"REJET GAMMA",31X,2F7.2)
     WRITE(6,502) INTE,INTEE
     RETURN IONE
 403 CONTINUE
     VPY=COEF*DFIST
     IF(NOHD.NE.0) GO TO 9
     IF(.NOT.LHD.OR.(ABS(HD-H1-HDM).LT.15.)) GO TO 4403
     WRITE(6,4402) (IOUT(L),L=4,6),IOUT(2),H1,HD,D,ADRES1(101)
4402 FORMAT(9X,3I3,I4,10X,"REJET HD-H ",F7.1,18X,F7.1,41X,2F7.2)
     WRITE(6,502) INTE,INTEE
     RETURN IONE
4403 CONTINUE
     IF(NFD    .NE.IOUT(2)) GO TO 9
     IF(ABS(VPY).LE.DV) GO TO 6
 404 JF1=JF1-1
     NFD=0
     GO TO 9
   6 IF(ABS(HD-H1-HDM).LT.4.) GO TO 404
     WRITE(6,8) (IOUT(L),L=4,6),IOUT(2),D,ADRES1(101)
   8 FORMAT(1H0,9X,3I3,I4,10X,"DOUTEUX F",73X,2F7.2)
     WRITE(6,502) INTE,INTEE
     IF(ABS(HD-H1-HDM).GT.10.) RETURN IONE
   9 CONTINUE
     DVPY=COEF*SIGMA
     IF(IAUTO.EQ.1) GO TO 150
     IF(DVPY.LT.2.) GO TO 1
     IF(DVPY.LT.3.5) GO TO 143
 151 CONTINUE
     WRITE(6,118) (IOUT(L),L=4,6),IOUT(2) ,VPY,DVPY ,D,ADRES1(101)
 118 FORMAT(6X,3I3,I4,28X,2F8.2,20X,"REJET DVPY",18X,2F7.2)
     WRITE(6,502) INTE,INTEE
     RETURN IONE
 150 IF(DVPY.LT.1.5) GO TO 1
     IF(DVPY.LT.2.) GO TO 143
     IF((DVPY.LT.3.).AND.(ABS(HD-H1-HDM).LT.2.5)) GO TO 143
     GO TO 151
 143 CONTINUE
 108 FORMAT(1H1)
     WRITE(6,119) IOUT(2)
 119 FORMAT(19X,I8,10X,"DOUTEUX DVY")
     WRITE(6,502) INTE,INTEE
     IF(NFD    .EQ.IOUT(2)) RETURN IONE
     JF1=JF1+1
     NFD=IOUT(2)
   1 IF(LHD) GO TO 2
     WRITE(6,3) (IOUT(L),L=4,6),IOUT(2),H1,HD,DHD,D,ADRES1(101)
   3 FORMAT(6X,3I3,I4,8X,"PAS DE HD ",6X,F7.1,18X,F7.1,5X,F8.1,27X,2F7.
    12)
     WRITE(6,502) INTE,INTEE
     IF(NFD    .EQ.IOUT(2)) RETURN IONE
     JF1=JF1+1
     NFD=IOUT(2)
     IF(((AUTO.EQ.1).AND.(HD.NE.0.).AND.((ABS(HD-H1-HDM).GT.9.).OR.(
    1DVPY.GT.0.5))) RETURN IONE
     IF((HD.NE.0.).AND.(ABS(HD-H1-HDM).GT.2.)) RETURN IONE
   2 CONTINUE
     IF(NFD    .EQ.IOUT(2)) CALL TRACER
 144 JNT=JNT+1
     IF(JNT.EQ.1000) JNT=1
     IF(.NOT.LHD) GO TO 147
     GERA=Y1-A*COS(PSIE)
     GERB=AMIN1(HD-H1,99.)
     WRITE(6,25) JNT,(IOUT(L),L=4,9),IOUT(2),X1,GERA,GAMMA1,H
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     11,VPY,DVPY,HD,GERB,DHD,D,ADRES1(101)
      GO TO 145
  147 GERA=Y1-A*COS(PSIE)
      ZE=0.
      WRITE(6,25) JNT,(IOUT(L),L=4,6),IOUT(2),X1,GERA,GAMMA1,H1,VPY,DVPY
     1,ZE,ZE,ZE,D,ADRES1(101)
  145 WRITE(6,7) ALFAP1*CPI
      BETAP2=BETAP2*CPI
      WRITE(6,8) BETAP2
      WRITE(6,502) INTE,INTEE,IOUT(64)
      NFA=IOUT(2)
      IF(CARTES.EQ.1) GO TO 1000
      LH=IOUT(4)
      LM=IOUT(5)
      MSEC=IOUT(6)
      AZIMUTH=90.0+CPI*(ATAN(GAMMA1/100.0))
      HITE=H1
      VEL=VPY
      ELEV=BDEUX*CPI
      UR=UR+1.0
      JO=JOUR
      MO=MOIS
      MY=IANNEE-1900
      WRITE(9,999) UR,MY,MO,JO,LH,LM,AZIMUTH,ELEV,HITE,VEL
  999 FORMAT(10X,F7.0,4I3,I2,2F6.0,F6.1,F6.0)
      CALL FGRODAT
 1000 RETURN
C
    7 FORMAT(1H+,95X,F6.1)
    8 FORMAT(1H+,93X,F6.1)
   13 FORMAT(6I2,1X,F8.2,F7.2,F6.1,6F7.2,1X,I6,1X,6(6)
   25 FORMAT(1X,I3,I5,2I3,I4,4F7.1,2F8.2,F7.1,2X,2F6.1,27X,2F7.2)
  574 FORMAT(6X,3I3,I4,50X,"ECHO ELIMINE-DOUBLE AMBIGUITE",13X,2F7.2)
  115 FORMAT(6X,3I5,I4,50X,"LA VITESSE NE PEUT ETRE CALCULEE",10X,2F7.2)
  116 FORMAT(6X,3I3,I4,50X,"LE SITE NE PEUT ETRE CALCULE",14X,2F7.2)
      END
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